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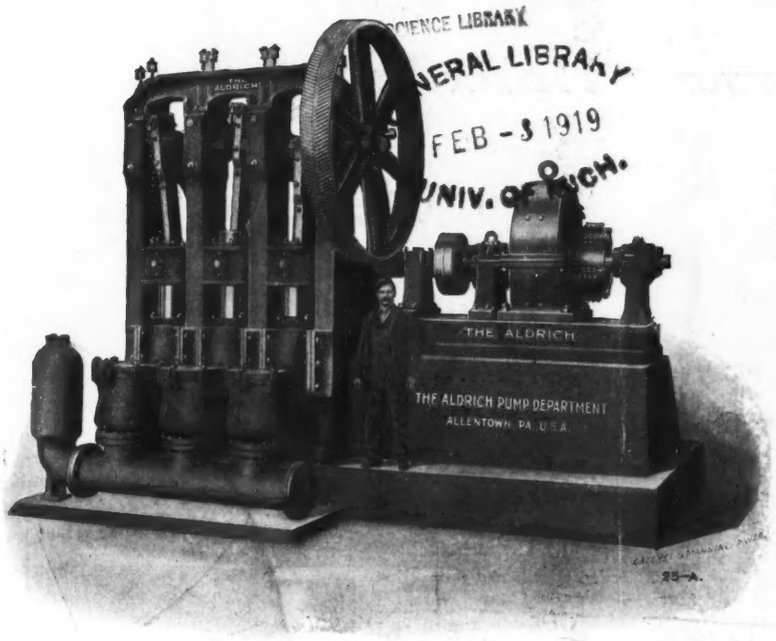

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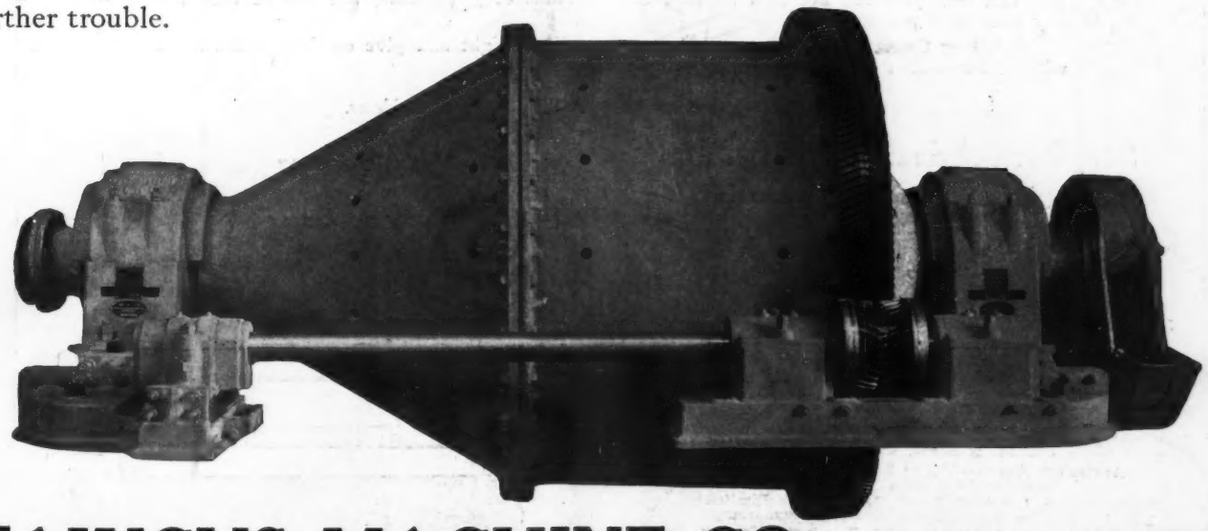

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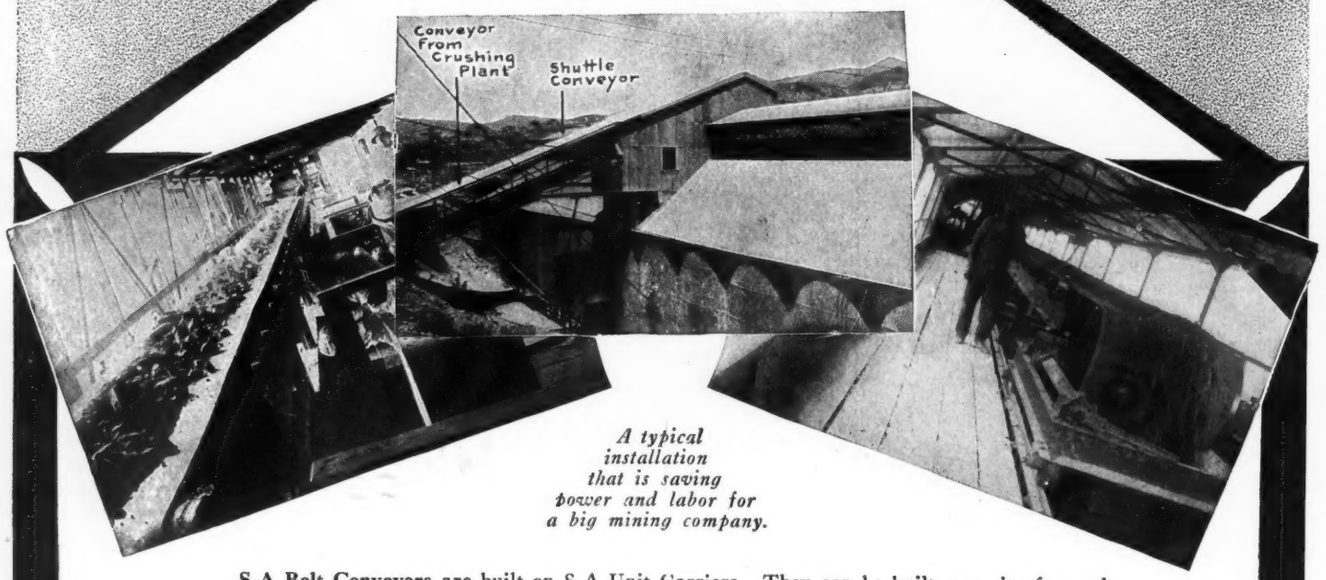

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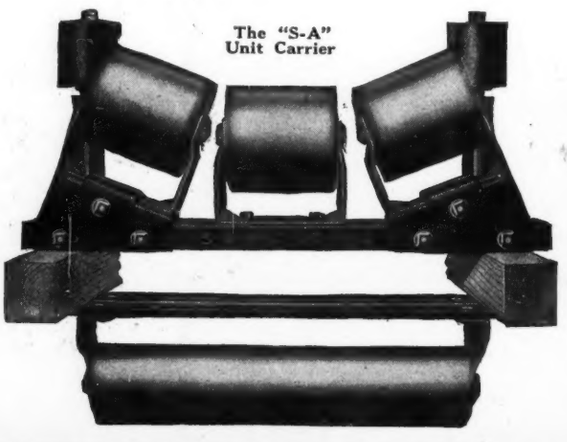

The "S-A" Unit Carrier

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OIL-SHALE DEPOSITS NEAR GRAND RIVER VALLEY, COLORADO

Commercial Possibilities of Oil Shale

By HARRY J. WOLF*

The development of an additional oil supply is an economic necessity. The oil-shale deposits of Western States hold the promise of a future supply of petroleum. Comparatively little progress has been made toward the exploitation of these deposits, and what has been done is largely of an experimental nature. In this paper the oil-bearing shales in Colorado and Utah are described, together with the present development. The writer warns persons of moderate means and without technical experience against engaging in the exploitation of these deposits.

IN THE last few years much has been written about oil shale in the United States, and particular reference has been made to the extensive deposits in Colorado and Utah. Valuable statistical information has been published in Government bulletins and technical articles, but a great quantity of the oil-shale promotion literature is of extremely doubtful utility. Though serving a legitimate purpose in some cases, much of the promotion publicity has had the general tendency to convey the impression to the casual reader that the commercial possibilities of oil shale have been favorably and definitely established, whereas the truth of the matter is that, with a few exceptions, comparatively little has been done in actual development of an oil-shale industry. Conservative investigators realize that the exploitation of oil shale involves large capital expenditure and requires, to be successful, the highest type of technical chemical ability and resourcefulness.

Government geologists have been to a considerable

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degree especially instrumental in drawing attention to the importance of oil shale. Most of the large deposits in the United States have been surveyed, mapped, and described in detail. Deposits worthy of attention have been reported in many states, but those in Colorado and Utah are the most extensive, and have received greater attention than those in other states. Statisticians have called attention to the increasing consumption of crude oil in the United States, and have presented data indicating that the older oil fields are approaching exhaustion, pointing out that the discovery of new oil fields is not keeping pace with the ever-increasing requirements. It has been estimated that the present rate of consumption will exhaust the known oil fields of the United States in about 20 years. As a consequence, oil shale is being hailed as a possible source of petroleum to meet future requirements.

Oil shale is not greasy or oily, and does not appear to contain free oil, but, upon the application of heat, the organic materials contained are broken up, yielding oil and gas among the resulting products. Tests on oil shale indicate a yield from 6 to 90 gal. of crude oil per ton of shale. Distillation tests on the crude oil indicate a possible recovery of 7 to 12% gasoline, 28 to 49% kerosene, and 39 to 62% residuum. Analyses of typical shales indicate one-half of 1% to 3% moisture, 20 to 52% volatile matter, and 45 to 80% ash. The asphalt varies from 0.5 to 4%, and paraffin from 2 to 9%. Chemists have isolated about 20 different products from oil shale.

The byproduct field in connection with an oil-shale industry will present innumerable problems and opportunities for oil-refining experts, manufacturing chemists, and chemical engineers. It is estimated that approximately 50 products of commercial value can be obtained from the reduction of oil shale. Included in these are gasoline, kerosene, light and heavy lubricants, gas oils, chemically solidified oils, carbon blacks, water-proof, acid-proof, and heat-proof enamels; varnishes for smokestacks, ropes, ore cars, and iron work; paints that prevent corrosion, resist great heat, and are weather proof; substitutes for hard rubber; products used in the manufacture of fine glass, pottery, and ornamental tile; different forms of dyestuffs heretofore made in Germany; ammonium sulphate, flotation oils, and producer gas.

Important Shale Deposits

The most extensive shale areas are those of Garfield and Rio Blanco counties, in Colorado, and Uinta, Grand, Wasatch, and Carbon counties, in Utah. The oil shale occurs in the upper half of the Green River formation in what is known as the Uinta Basin. In Utah the shales are exposed in the valleys of the Uinta, Green, and White rivers, and several of their tributaries. The northwestern part of the Colorado shale area, in Rio Blanco County, is exposed along the White River, west of Meeker, and its tributary, the Piceance Creek. The southern exposure, known as Book Cliffs, is exposed along the north side of the Grand River Valley between Rifle and De Beque, and is cut by the gulches of Roan Creek, Conn Creek, and Parachute Creek, which flow southward into the Grand River.

The most prominent centers of activity in connection with the development of oil shale are Grand Valley and De Beque, in Colorado, both on the Denver & Rio Grande R.R., and Watson and Dragon, in Utah, on the Uinta R.R. The Colorado shale area covers more than 2500 square miles, and the Utah area over 3000 square miles. Bands, or strata, of shale vary in thickness from a few inches to 80 feet.

Recent Development

The most important step in the development of oil shale so far recorded is being taken by the Ute Oil Co., of St. Louis, Mo. This company is erecting a 400-ton shale-oil plant about eight miles from Watson, Utah, on the White River. This is the largest shale-retorting plant under construction in this country. The

CLOSE VIEW OF TYPICAL OIL-SHALE FORMATION NEAR WATSON, UTAH

Wallace process is to be used. The decision to erect the new plant was based on the results of extensive testing of many samples of shale. The site of the new plant was carefully considered with regard to the availability and the delivery of the shale, and the disposal of the residue. The deposit is in the form of a long, high bluff, with no overburden.

Methods of Mining and Milling

The mining consists of drilling and blasting down a supply of shale once or twice a week. The shale is then broken by hand to 10 by 15-in. size, and delivered to a 48-in. American pulverizer of ring-and-hammer type, capable of receiving a piece as large as 15 by 45 in., and crushing to ½ in., with 20% fines and 10% over ½ in., with a capacity of 50 tons per hour. The crushed material will be delivered, by an endless belt conveyor, to shale storage bins. From the bins the material will be received by larries, three in number, running on separate monorails. Each larry will serve six retorts. The oil from the retorts will be conducted through condensers and washers into a large crude-oil storage tank. Each retort holds one ton of shale. It is claimed that the process will extract 90% of the total available oil in one hour. Shale from this locality yields an average of 54 gal. of oil per ton of shale retorted. The lowest yield is 31.5 gal. and the highest is 80.5 gal. per ton. It is estimated that the shale, retorted, will yield about one barrel of oil per ton.

In Colorado the oil-shale retorting plants installed to date, or in process of erection, are in the vicinity

of De Beque. The American Shale Refining Co. is developing oil-shale properties on Conn Creek, about 12 miles from De Beque. This company plans to install several 150-ton Wingett retorts. One of these retorts has been made by the McFarlane-Eggers Machinery Co., of Denver, and has been shipped to the property. A 3000-ft. tramway, with a capacity of 900 tons per day. is to be installed to deliver shale from the mine to the retorting plant. The company's property has an area of 12,000 acres. The shale cliffs rise to a height of 2500 ft. There are five different strata of oil shale. The highest and richest stratum is 60 ft. thick. Extensive tests indicate a yield of 60 gal. of crude oil per ton. A second stratum 200 ft. below the first is 75 ft. thick and is expected to yield 50 gal. per ton. The available oil in these two strata is estimated at about 20,000,000 bbl., and the ammonium sulphate at approximately 20,000 tons.

The Oil Shale Mining Co. is developing property on Dry Creek 20 miles northwest of De Beque. It has erected six retorts of the Henderson type, each with a daily capacity of 6 tons. This is the first plant of its kind in the United States. The seam of oil shale is 10 to 20 ft. thick, and averages 75 gal. of oil per ton. The Mount Logan Oil Shale Mining and Refining Co. is developing property on Mount Logan, four miles from De Beque. It has three 20-ton retorts. Samples of shale have yielded as high as 100 gal. of oil per ton. The Colorado Carbon Co. is developing property on Kimball Creek, 27 miles from De Beque. Its main seam of shale is 60 ft. thick. Samples indicate a yield of 70 gal. of oil per ton. Many small companies have been formed with the view of exploiting oil-shale deposits in a limited way, but most of these organizations are not supplied with adequate capital for the work they have undertaken.

Comparison With Scottish Shale Deposits

In discussing the commercial possibilities of the shale-oil deposits in the West, reference is usually made to the shale-oil industry in Scotland, established in 1850, where the technical problems of the industry have been carefully worked out and over 3,000,000 tons of shale is profitably treated annually. It is true that these shale beds are comparatively thin, irregular, steeply inclined, deep, and expensive to work, whereas the deposits in Colorado and Utah are relatively thick, are located at elevations well above suitable sites for distillation plants, so that in most cases the crude shale can be transported with the assistance of gravity; have in many places little or no overburden, and in some cases can be mined with a steam shovel. Further, it is pointed out that Scottish shales average a little over 20 gal. per ton, and that Colorado and Utah shales with averages of 40 to 50 gal. per ton are common.

Commercial possibilities of Western oil shales are attractive and promising when it is considered that the difficulties of mining are less than, and the oil content is double, that of Scotland. However, it should be pointed out at the same time that the production of crude oil alone from shale probably cannot now compete commercially with oil from wells, and that the Scottish oil could not be worked profitably were it not for the ammonium sulphate produced as a byproduct.

It is reasonable to suppose that until the demand for oil has increased and the production from wells has decreased, the larger profits from oil shale will be in the refining of the oil and the recovery of by-products, rather than in the production of crude oil alone. All of this suggests that in the consideration of projects for the development of an oil shale, not only the usual caution must be exercised in determining the average oil content of the raw material, but, also, ample capital must be provided for proper development and expensive equipment, and the highest type of technical and chemical ability must be secured. The mining or business man with limited capital at his disposal cannot hope to engage in the exploitation of oil shale with any chance of success.

The accompanying illustrations were courteously supplied by the Denver & Rio Grande Railroad Company.

Mineral Land Classified in Wisconsin

In 1918, the Wisconsin Geological Survey examined 14 townships in central Wisconsin, making a study of the geology, with the idea of determining what indications there are of economic minerals, especially iron formation. Blueprints have been prepared showing each of the 14 townships with the pre-Cambrian rock outcrops, magnetic lines, roads, streams, and general topographical features. These blueprints will be ready for distribution during this month.

The townships covered lie in Wood and Clark counties, and include the following: Township 24 N, Ranges 1 and 2 E; 1, 2, 3, and 4 W; and township 25 N, ranges 1, 2, 3, and 4 E; 1, 2, 3, and 4 W. These blueprints may be obtained at cost, 10c. a copy, or the entire set for $1, upon application to W. O. Hotchkiss, state geologist, at Madison.

Anarchy in Mexico*

In spite of the policy of silence and suppression of news, reports of the actual conditions of things in Mexico continue to leak out. Washington dispatches go so far as to say that even the State Department and the President have heard disquieting tales of anarchy, and that the cables are carrying frequent reports even to Paris.

Thus, in the Tampico oil region there have been over 90 hold-ups and robberies of company paymasters by bandits during the last year. The total stolen is not known, but one gang got away with $40,000. These involved some killing, not a few of the victims being American citizens. Many oil wells have been sealed up in the hope of saving them when a greater conflagration starts.

Oaxaca, which is a mining state, has never been really controlled by the Carranza faction. Its condition is now undiluted anarchy. Many of its mines and smelteries are owned, and used to be worked, by Americans, who bought and developed them 20 or more years ago. Now there is no law or order or real government in the district.

What are we going to do about it? Is it profitable, or even safe, to limit our interest in the situation to mere language?

*From the *Evening Sun*, New York, Jan. 14, 1919.

Standardization of Mine Cars in Metal Mines*

By R. M. RAYMOND†

Metal-mine accidents which are classified as being due to transportation may be reduced through the use of properly proportioned cars that are equipped in accordance with the best safety practice. Owing to the varying conditions involved, it is difficult to select a standard car which will be suitable for the requisite purposes, but, by means of a classification that groups according to size and method of locomotion, certain practices in the making of cars can be established and a uniformity agreed upon which will attain safe and economical results.

NEXT to casualties and fatalities by explosions, and those due to falls of ground and similar causes, occur those accidents resulting from transportation, either in loading cars, or in hauling and in dumping them. In 1916, accidents from these causes were as follows: Loading, 1.43% killed, 12.34% injured; hauling, 4.74% killed, 10.83% injured. At Anaconda, where special attention is paid to safety measures, 8.8% of all accidents and 14.8% of the fatal and serious accidents are caused by mine cars. Many of these injuries are the result of the car falling back on men while in the act of dumping.

Transportation Accidents May Be Reduced by Better-Designed Cars

One striking point in these figures is the proportion of fatal accidents classified under haulage. The figures no doubt include injuries to men walking on the track as well as accidents to trammers and to trainmen. Also, the fact that in minor accidents the proportion considered as being due to the loading of cars is greater than minor accidents which occur in the operation of hauling. Accidents from transportation are due not alone to the cars themselves, their structure, defects and other features, but to the condition of drifts and roadways, to inferior track; steep grades, sharp curves, and lack of warning of moving cars and trains, all of which cover probably the greater proportion of casualties. However, the present article deals entirely with the structure of cars. There is no question that a large number of accidents can be prevented by better-designed cars, and by providing arrangements for handling cars singly or in numbers.

Varying Conditions Necessitate Car Classification

Standardization of metal-mine cars is difficult, for the varying sizes and conditions of drifts present a diversified problem. Drifts range from those of large size and having no timber, as in limestone deposits and in those driven at great depth, to drifts necessarily small on account of a broken, faulted formation and heavy orebodies, such as occur in Butte. Cars in metal mines consequently may be divided into three sizes and classes: (1) Cars operated by man-power, with capacity of 18 to 30 cu.ft. and holding from ¾ to 1½ tons, which may have end doors, dump forward, or may swing and dump to one side; (2) cars operated by mule haulage or storage battery, of 1½ to 2½ tons each, or a number of the smaller man-size cars handled in trains; (3) cars operated by electric motors of 3-, 4- or 5-ton capacity, flat-bottomed side-dump, gable-bottomed side-dump cars, or solid body dumped by a revolving cradle. Special cars for handling men in and out of mines, both in tunnels and in drifts, will also be considered.

Small Man-Operated Cars Require Low Center of Gravity

In the use of small cars operated by men, it is essential, both when loading at faces and when drawing ore from chutes, as well as in the handling of the car, to have the center of gravity of the load as low as possible. Another point is to have a car of such ample capacity that material loaded at the face or from chutes does not fall over the sides. Wheels and axles, though flexible, should be firmly placed in good bearings to preserve good alignment on the track and protect the flanges of the wheels. Lubrication of journals and wheels should be effective for long periods. No projecting parts or sharp corners should be permitted. The car should have sufficient strength to preserve its form and good condition at all times and even withstand the accidents of derailing. The fastenings of doors, couplings, and brakes should be such that they will be secure, and without dangerous features of construction.

A truck made of 4-in. or 5-in. pressed steel or channel iron, formed to shape in one piece, with a low dumping ring and bar for dumping straight ahead and when dumping at the side, a flat turntable of malleable steel rings or central plates, tends to keep the car body low. Such construction, compared with the old style of pivoting the body on a yoke or heavy cast dumping iron, has considerable advantage. Wheels of 12-in. diameter, and of solid web, are the most satisfactory in size for the smaller cars. The steel used in the tread should be from 2¾ in. to 3 in. wide and chilled. Wheels of manganese steel are found economical in some siliceous mines, but a wheel made of good gray iron and operating on clean tracks should wear for several years without grooving. Loose boxes or bearings are fortunately seldom used, and a solid saddle provided with Anaconda or McCaskell axles has great advantage. Better still are roller bearings of Hyatt or Whitney type, both of which are now being applied to man-size cars, and are of advantage in the use of a larger car body and provide ease of manipulation, with cheaper and better lubrication, than is possible on the usual small-sized car.

Roller bearings are advantageous even for man cars, as well as for motor haulage, and are economical in the long run. In addition to ease of operation, they have the great advantage of preserving the alignment of the axles, protecting flanges of the wheels and giv-

*Paper read at Seventh Annual Safety Congress of National Safety Council, St. Louis, Mo., Sept. 18, 1918.

†Professor of mining, Columbia University, New York.

ing the best of lubrication, with reduced quantity, for long periods. If roller bearings are not used on man cars, solid bearings with tight and loose wheels on the axles, provided with dust-proof receptacles, should be used.

Wheel Base, Dumping Device, and Tracks

The wheel base should be one-third the length of the car body. To preserve good balance, the dumping hinge should be placed far enough ahead of the middle half of the car to prevent it from tipping when an obstacle on the track is encountered, or when the car leaves the rail, and four to five inches is usually satisfactory for the smaller car. For man-handled cars of 24- to 30-cu.ft. capacity, there is no reason why wider gage tracks cannot be used, and a 20-in. gage, instead of the usual 18-in., would give better bearing and less danger on curves.

Increase in Size of Small Cars Advantageous

Until recently, car bodies have been small in area and rather narrow in width. Providing better track of 16-lb. rail and larger drifts for improved ventilation and drainage permits the use of 20- to 25-cu.ft. cars, and on good grades of 0.4% as well as a good track, even a 30-cu.ft. car can be handled by one man. This requires a car of from 10 to 12 sq.ft. in area, in place of 8 sq.ft. or under. The larger area is of importance in reducing accidents due to material falling over the sides. The width of the body is limited by the size of the drift in order to secure clearance; but, in most mines, drifts are more frequently six feet wide in the clear and seldom under that, so that a car 30 in. wide is entirely feasible, and even 32 in. to 34 in. may be allowed for man-size cars.

The height of the car above the track should be, if possible, not over 44 in. when shoveling at the face. Cars of 24-cu.ft. capacity can be made of good shape within that height; those used for loading from chutes can be larger—48 in. to 50 in. in height, with a capacity of from 26 to 30 cu.ft. These sizes can be easily operated by one man on good tracks and easy grades. Figs. 1 and 2 show, respectively, typical cars of 22- and 26-cu.ft. capacity.

For man-size cars, side sheets of $\frac{1}{8}$ in. need little reinforcement, and flat bands at the top are sufficient, with angle-iron inside at the bottom. When absolutely necessary for heavy ores, angle-iron, if used at the top, should be placed inside.

Suspension of Doors and Methods of Fastening

Doors are usually hung from a bar at the extreme end and outside of the body. As cars become used and worn, leakage of material occurs and fines run out on the track. The door hinged from the top strap a short distance back from the front gives a tighter fit at all times than if hung from a rod at the outer end of the body. If the front edge be sloped slightly forward, instead of perpendicular, a still better fit results.

The fastening of the car is also important. The usual lever, with a hook on the lower end engaging a socket at the back end of the car, and a catch at the forward end, is not sufficient to prevent the body from becoming loose on the turntable when the hook and latch become worn. Designs of spring attachment for closing the door become defective in time. One improvement is to have the body engage a small pin on the truck, and this, in addition to the usual latch, keeps the body firmly in place. The pin may be a fixed vertical pin for forward-dumping cars, and either a fixed or removable side pin for use on side-dumping cars, such as is shown in Fig. 3.

Other Construction of Car Should Be Such as To Avoid Possible Accident

The handle of the lever should miss the top of the car by three or four inches, the side by six inches, and it should be placed at least three inches from the body of the car. The ring securing the handle should allow at least five inches clearance between the handle and the small bar holding the ring, and the latter should be placed at the back of the car, rather than at the side.

For dumping, the car should be so hung that a man can easily lift the car body without moving the truck or forcing it backward. Handles placed at a height of 28 in. or 30 in. above the ground give the car better control when dumping than when placed nearer the top of the body. The handles should be fastened entirely on the back sheet of the car and should not project or be fastened on the sides.

Use of Guard Boards on Cars

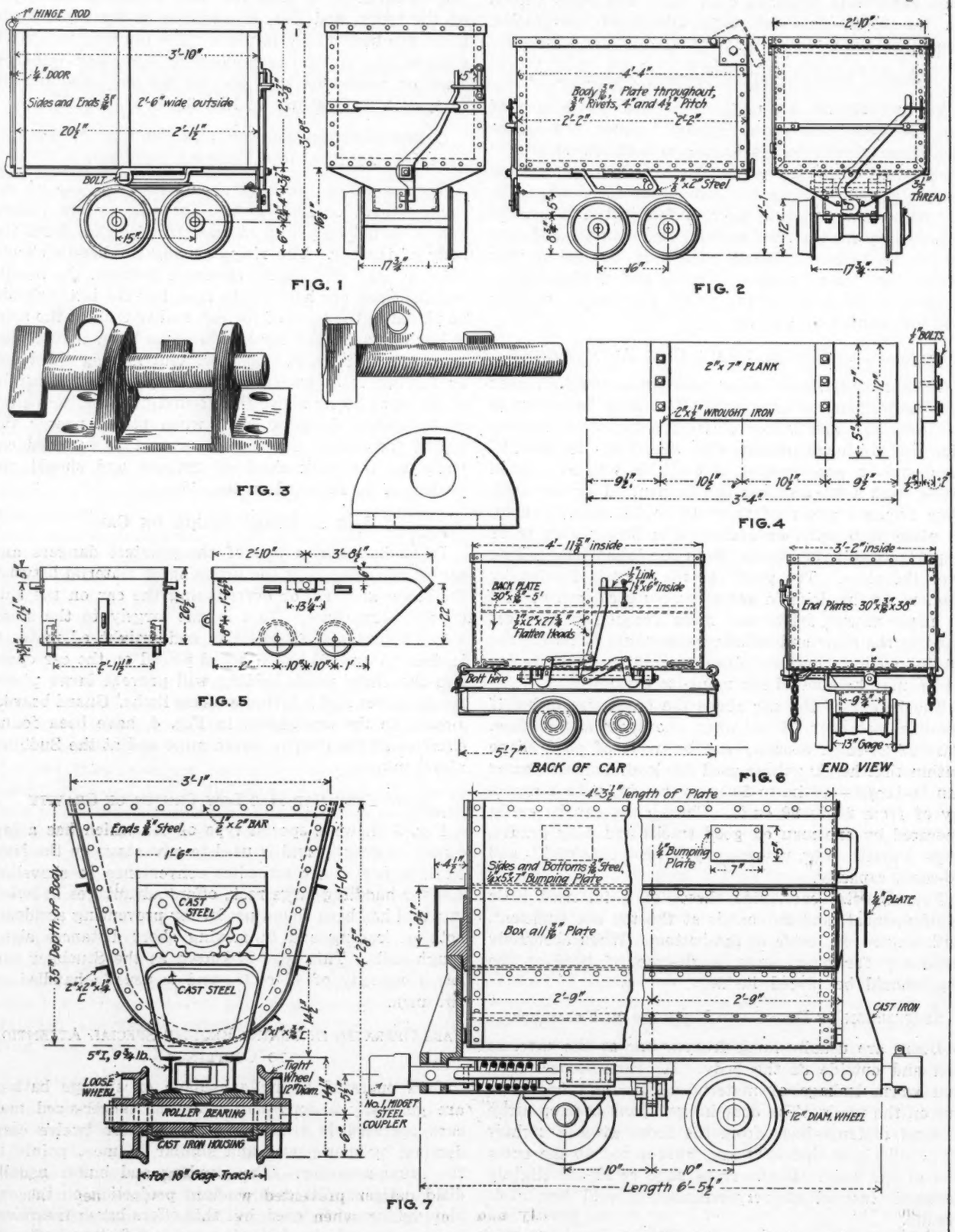
In loading a car, one of the greatest dangers and causes of accidents is the dropping of material between the chute and car, or overrunning the car on the side opposite the chute. This is due largely to the small area of cars and to the size and weight of material loaded. A special guard board placed on the car opposite the chute while loading will prevent large pieces running over and injuring a man's limbs. Guard boards, similar to the one shown in Fig. 4, have been found effective at the Copper Queen mine and at the Sudbury nickel mines.

New York Car Has Low Center of Gravity

Fig. 5 shows a special type of car which has a low center of gravity and is used to advantage on the New York subways. It embodies convenience in shoveling and for handling large rock, offers advantages in hoisting, and has been found useful for preventing accidents both in loading and in moving short distances along rough rails. This type is known as the Stuebner car, has a capacity of 40 cu.ft., and is usually handled by two men.

Cars Operated in Trains Require Special Attention to Couplings

Cars operated by mule haulage or storage battery are generally a combination of the larger-sized man cars operated in trains of four, six, or twelve cars, dumped by man-power and similar in most points to the usual man car. The coupling and buffer usually differ. On smaller cars a slight projection on the end plate is frequently used, but this offers harsh treatment to the door of the following car. A better buffer is formed by the extension of the frame of the truck or with the regular spring drawhead, with curved buffer and link and pin coupling, such as is used in coal mines. Both of these are of advantage in convenience and



FIGS. 1 TO 7. TYPES AND ACCESSORIES OF UNDERGROUND MINE CARS

economy. Instead of using a link and pin, chains at the side or just under the body at the sides may be used on a straight track, but they are a disadvantage on a curved track. When chains are so used, rings should be substituted for hooks, and caught into properly shaped rings on the forward car. It is important and necessary on cars of this size that roller bearings be used, as they make it possible to handle larger cars with greater ease, particularly on long hauls.

Advantages of Side-Dump Car

Another form of car which eliminates the troubles often met in the use of end-dump cars and of turntables is the side-dump car with a rectangular body, illustrated in Fig. 6. This car, which has a capacity of 40 cu.ft., can be made smaller, but in this size can be handled for short distances by a man and for longer distances

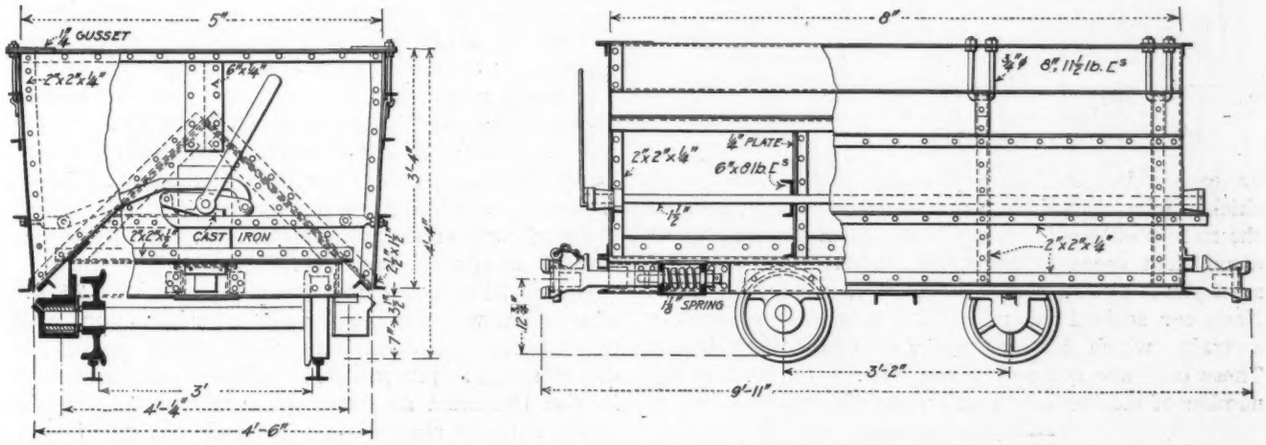


FIG. 8. GABLE-BOTTOM CAR FOR MOTOR HAULAGE

by animals or by electric power in trains. It has the advantage of being easily dumped by means of lever on the opposite side of the door. The truck is arranged to extend beyond the body of the car, so that it acts as a buffer; and the couplings, placed at the side and provided with ring catches, are convenient, and obviate any possibility of catching clothes or fingers.

Rolling Dump Car Offers Large Clearance

The rocker car, or rolling dump car, as shown in Fig. 7, is becoming popular for underground use and offers the advantage of having no doors or catches excepting those that are necessary to hold the body erect. One disadvantage of these cars hitherto has been the high center of gravity, but they are now being made lower, and are useful on track wider than 18 in. They have the further advantage of allowing large clearance between car bodies, offering opportunity for easy manipulation of coupling, and can be further improved by installing automatic couplings. When brakes are used, the brake lever should be placed at the side of the car, and the handle of the lever should be a closed ring.

Cars Operated by Motor Haulage

Comparatively speaking, the center of gravity and the area of cars operated by motor haulage are much better taken care of than in the small man-size cars, and the fewer accidents in loading and dumping with such cars are features for consideration in the structure and build of the smaller-sized car. These cars are made either with gable bottom and side doors, as shown in Fig. 8; flat bottom, with special attachment for dumping, as the Granby car, or with a solid body for dumping by means of a cradle. Though the former construction is more frequently used, the latter is preferable when the tonnage is sufficiently large or can be handled only from a few levels at a time. The extra expenditure for cradle, and for operating by power, with the cheaper solid-body car, is less than the greater expense of the gable-bottom car and the necessary hinges and levers.

Features of Gable-Bottom Cars

The larger-sized car used for such transportation requires special features, both for strength of car, method of operation, and additional provisions for safety. The truck, made usually of channel iron, or, better still, pressed and curved channel iron, should have a spring drawhead and coupling, either with link and pin—the latter caught by chain—or, for the larger-sized cars, the M. C. B. Midget couplers. These are more expensive, but for rapidity and safety are to be preferred, and pay in the end. Wheels and axles should be of first-class materials, with roller bearings in the boxes and not in the wheels.

Elimination of Projections Is Advantageous in Safe-Car Construction

The structure of the body, which is necessarily reinforced by angle-irons, can be improved upon if pressed forms, or any form of brace giving both strength and little projection on corners of cars and on doors, are used. Levers and toggles holding doors are important features, and are arranged to give easy and quick operation. However, projecting points and angles for handling levers should be done away with, and, instead, curved, ring-closed handles, which prevent catching of clothes and are more easily operated, should be used.

Expense is curtailed by the adoption of the solid car, and danger prevented while doors are being shut or opened, or when cars are being dumped; and by running two or three cars into a cradle of sufficient length, the tonnage handled in the same period of time will be as great as or greater than by the use of the flat bottom car. Also, the solid car obviates delays and accidents which may attend use of the gable-bottomed car.

There is little danger or opportunity for accident in the revolving cradle, which eliminates nearly all accidents attendant on the dumping of cars at the hoisting shaft.

Transportation of men underground for long distances has become an important item in mine operation. An excellent example and type of car for handling men safely is that in use at the Inspiration Copper mine and shown in Fig. 9. These are made from timber trucks 9 ft. long, covered with 2-in. flooring, with seats

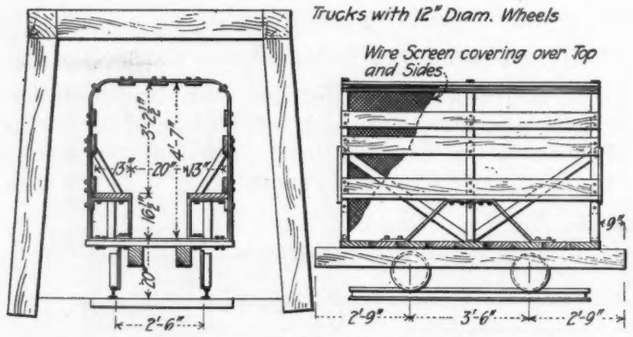


FIG. 9. UNDERGROUND MAN CAR

on each side. A frame of strap iron covered with chicken wire, formed into prairie wagon shape, permits the men to sit erect but not to stand. Bumpers provide a sufficient space to allow men to enter the car, and steel plates extend from the frame above the bumpers. Each car seats 12 men, and 10 cars are operated in a train, which has right-of-way over other traffic. These cars are not only a convenience but reduce the number of men traveling on foot on the main roadways.

Feasibility of Electric Smelting of Iron Ores in British Columbia

A report on "The Commercial Feasibility of the Electric Smelting of Iron Ores in British Columbia" has recently been completed by Dr. Alfred Stansfield, professor of metallurgy at McGill University and consulting metallurgist. This report deals with the subject in a complete and detailed manner and draws the following conclusions: Electric smelting of iron ores in British Columbia is feasible from a metallurgical point of view. There is a sufficient supply of ores of a quality suited to the process and capable of being converted into a high quality of iron or steel, and there also are available all the requisite fluxes required to carry out the process completely. However, two difficulties are made clear. The one which is most emphasized is the question of the cost of electric power under existing conditions. Doctor Stansfield finds that, with power companies demanding the rates which were quoted by the largest concerns in the province, the profitable production of pig iron by means of electric smelting would not be feasible.

The reports states that the iron orebodies of British Columbia have not been opened to any extent, but the reserves are ample and of fair grade, although chiefly magnetites, and so undesirable for use in the blast furnace excepting when mixed with other ores. The magnetite ores are not of high grade, but contain from 50% to 55% Fe, are practically free from phosphorus, titanium, and copper, and the proportion of sulphur can probably be kept as low as 0.1%. It is estimated that 50,000 tons a year can be delivered at a suitable smeltery site, at a cost, under present conditions, of about $4 per net ton.

Doctor Stansfield says that British Columbia is well supplied with water power, and many sources can be developed chiefly for the use of electric smelting and similar industries. The consumption of power, under conditions obtaining in British Columbia, would be between 0.4 and 0.5 horsepower-year per ton of iron produced, so that the cost for power should be between $4 and $5 per long ton of pig iron. In view of the desirability of producing pig iron at the earliest possible time, and of the difficulty and expense attending the development of water power under present conditions, it is highly desirable, if not imperative, that an electric smelting industry shall be supplied, in the first place, from sources of power that are already developed.

It is explained that the British Columbia Electric Railway Co. has surplus power, but the charge would amount to $27.80 per horsepower-year, which would represent a charge of from $11 to $14 per ton of iron. The latter would be the rate in the British Columbia mainland, but on Vancouver Island 2000 kw. of power was to be available for a short period, subject to peak load restrictions, at $15 per horsepower-year. The increase, it is maintained, makes the cost too high to allow of commercial production of pig iron by present methods at or near Vancouver City.

Doctor Stansfield states further that 20 to 25 tons of charcoal would be needed daily for an output of 50 tons of pig, and, though no considerable charcoal industry exists at present, there is in the coast district of British Columbia an abundant supply of timber from which suitable charcoal can be made for use in electric smelting, which could be delivered at the smeltery at a charge of between $2.40 and $4 per ton of iron.

The cost of labor would probably be from $4 to $5 per ton of iron, although in the initial stages of the industry it might run as high as $7 per ton.

As to cost of production, it is stated that a simple plant, assumed for purposes of calculation only, would consist of three electric furnaces of 3000 kw. each, producing altogether about 80 tons of pig iron daily, and would cost from $350,000 to $400,000 to erect in British Columbia. The cost of making a long ton of foundry pig iron in such a plant would be estimated as follows, assuming that power can be obtained at $15 per horsepower-year:

ESTIMATED COST OF ONE TON OF FOUNDRY PIG IRON MADE IN BRITISH COLUMBIA

Iron ore, 2 net tons @ $4	$8.00
Electric power, 0.45 hp.-year @ $15	6.75
Charcoal, 0.4 net ton @ $8	3.20
Electrodes, 15 lb. @ 8c.	1.20
Repairs and maintenance	1.00
Labor	4.50
Management	2.00
Interest, 6% on total capital; and depreciation, 10% on cost of plant	2.60
Royalty	0.50
Total	$29.75

The situation of a smeltery should be convenient with respect to the supplies of ore, charcoal, and other requirements, and should also permit of the cheap delivery of the iron and other products to the market. With reference to the market, it is stated that the consumption of pig iron in British Columbia now is only about 10 tons daily, but, with more moderate prices, this consumption, it is thought, might be raised to 20 or 30 tons daily.

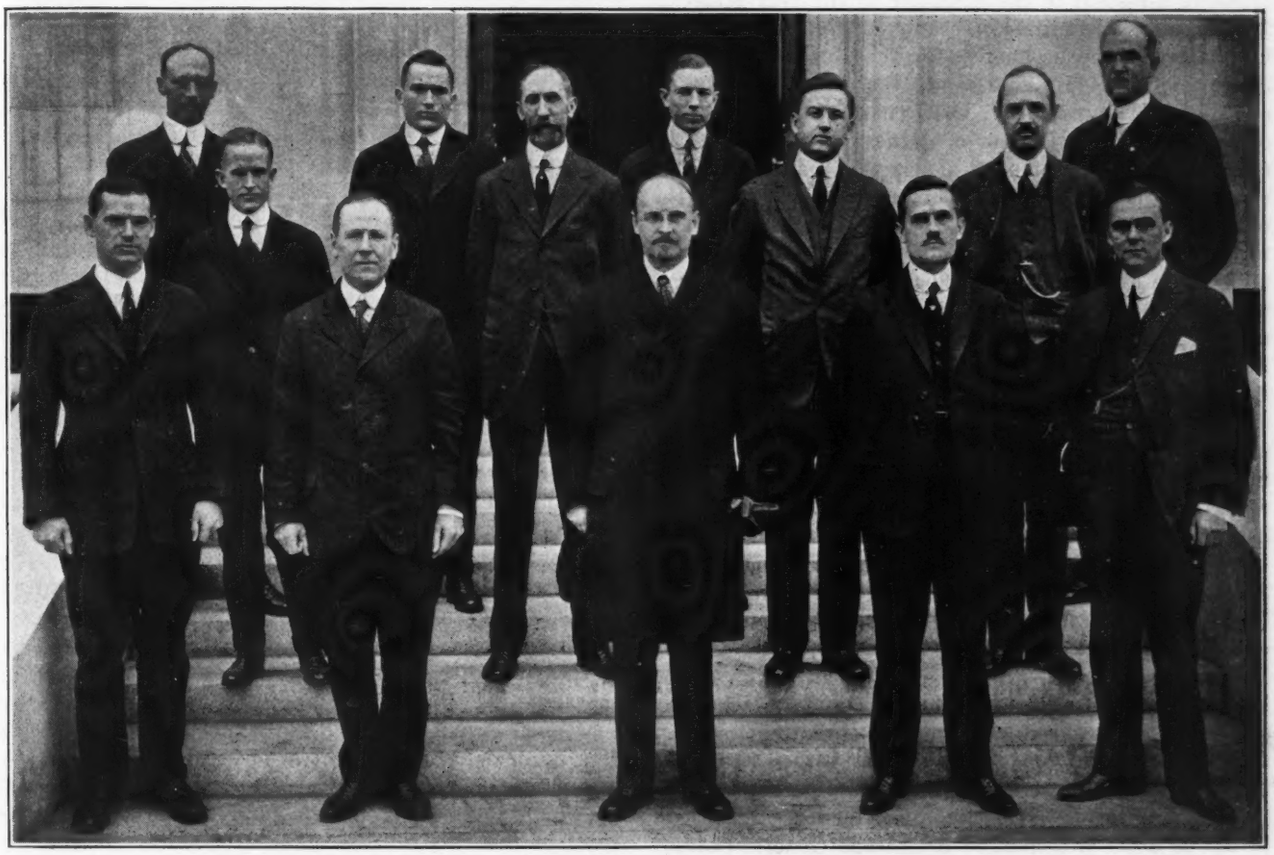
Technicians in Government Service

IN JULY, 1917, the War-Minerals Investigation Committee was established to undertake a coöperative study of the problems connected with the war minerals. This committee was composed of William Young Westervelt, representing the American Institute of Mining Engineers and the Mining and Metallurgical Society of America; W. O. Hotchkiss, representing the Association of State Geologists; David White, of the U. S. Geological Survey, and A. G. White, of the Bureau of Mines. Later H. S. Mudd became assistant secretary of the committee. This committee coöperated with the different agencies interested in developing domestic mineral resources, and promoted the utilization of volunteer services and the most capable engineers for work of special importance.

Another organization, the Joint Information Board on Minerals and Derivatives, was organized to act as a clearing house of information for all of the Government departments interested in mineral problems. Mr. Mudd acted as the representative of the Bureau of Mines on this board.

The Bureau of Mines endeavored to aid producers of war minerals in regard to matters of priority in transportation, fuel, and equipment, in the construction of highways and roads, in the problem of labor supply, and in a study of mining and milling methods. Summarized reports were furnished to the War Industries Board and the Shipping Board, and the Bureau's engineers were at all times ready to take up any mineral problems confronting the various Government agencies connected with the conduct of the war.

At the close of the fiscal year, the War-Minerals Investigation Committee comprised about 100 persons, of whom about 90 were mining engineers, metallurgists, or chemists. Of these, about two-thirds were engaged in staff and field work; the remainder, consulting engineers, were employed only for short periods and on special problems. The larger part of this organization was formed during the last three months of the year. Parts of the work had been carried out previously under the mining, metallurgical, and mineral technology divisions of the Bureau. The investigation was temporarily under the direction of D. A. Lyon, superintendent of stations, assisted by H. S. Mudd and A. G. White. Now it is in charge of J. E. Spurr, as chief executive.



TECHNICIANS ON WAR-MINERALS INVESTIGATION COMMITTEE

Most of the experimental work of the War-Minerals Investigation Committee was done at the mining experiment stations of the Bureau. The investigations cover the concentration and metallurgy of manganese ores at the Minneapolis station; special high-grade clay products, at the ceramics station at Columbus, Ohio; the recovery and use of pyrite from coal mines, at the station at Urbana, Ill.; potash, tungsten, molybdenum, and rare metals, at the station at Golden, Colo.; concentration and hydrometallurgy of low-grade copper

*Partly abstracted from the eighth annual report by the Director of the Bureau of Mines.

ores, and field investigations of manganese, at the station at Tucson, Ariz.; graphite milling, at the station at Salt Lake City; work relating to the production of sulphur, quicksilver, and chromium, at the station at Berkeley, Calif., and concentration tests of chromium, manganese, quicksilver, and tin ores, at the northwest station, at Seattle, Washington. Practically all the work of the Minneapolis station has been in connection with the concentration of manganese ores.

NUMBER OF ENGINEERS ENGAGED IN WAR-MINERALS INVESTIGATIONS INDICATES EXTENT OF OPERATIONS

A few of the technicians connected with the investigation of war minerals appear in the accompanying halftone. Reading from left to right they are: A. G. White—In charge of the sulphur resources, also administrative assistant to the executive of the War-Minerals Investigation Committee; secretary of the War-Minerals Committee; mine economist for the Bureau of Mines. J. E. McGuire—In charge of the investigations on chrome and tungsten. J. C. Orchard—Assistant mine economist for the Bureau of Mines; in charge of the editing and publication of a series of confidential reports on the political and commercial control of the mineral resources of the world. W. C. Phalen—Mineral technologist for the Bureau of Mines; field work on manganese for the War-Minerals Investigation Committee. G. J. Salmon—In charge of labor problems connected with the metal and non-metalliferous mining industry; member of Committee on Mechanical Labor-Saving Devices as applied to mining, also in charge of matters related to industrial furlough from the Army in coöperation with the War Department. A. W. Stockett—In charge of the investigations on potash resources; and a member of the committee of the Bureau of Mines appointed to advise the Capital Issues Committee on mining and related applications. J. E. Spurr—Executive of the War-Minerals Investigation Committee of the Bureau of Mines, and former member of the Committee on Mineral Imports of the Shipping Board. H. S. Mudd—In charge of the investigation on graphite, antimony, and bismuth; assistant secretary of the War-Minerals Investigation Committee; member of the Committee of the Bureau of Mines appointed to advise the Capital Issues Committee on mining and related applications; representative of the Bureau of Mines on Joint Information Board and General Contact for the minerals and their derivatives. A. E. Wells—In charge of sulphuric acid work for the Bureau of Mines in coöperation with the War Industries Board and the Chemical Alliance. H. C. Morris—In charge of investigations on various metals; also a member of the committee of the Bureau of Mines appointed to advise the Capital Issues Committee on mining and related applications. C. M. Weld—In charge of investigations on manganese iron ore, ferrosilicon and chrome; representative of the Bureau of Mines on Ferrous Section of the War Industries Board; now assistant executive of the War-Minerals Investigation Committee. F. H. Probert—Engaged in special field work for the War Minerals Investigation Committee; dean of the mining department of the University of California; consulting engineer of the Bureau of Mines. H. A. Buehler—In charge of the investigations on pyrite; also state geologist of Missouri.

Cheap Leaching of Gold-Ore Tailings

A method of cyaniding tailings in vats the sides of which are formed by the separated slime has been patented (N. 6516, of 1918) in Australia by John Nicholson. As the conditions which led to the adoption of this method at the Dustholes (Myrtle) gold mine, in South Australia, are found on many other small properties, the details are of more than local interest. The following notes have been compiled from information given in the *Mining Review* of the Department of Mines of South Australia, for the half year ended June 30, 1918.

When previously worked, the method used was to follow the various gold-bearing seams and to mine them selectively. As the seams are, comparatively, of small size and occur irregularly, and, so far as the assays have shown, are not of exceptional richness, this method was not successful. The present owner purposes adopting a different method, and to mine the ore, together with the intervening country in a face of suitable width, by means of an open cutting. The ground broken will then be roughly sorted by screening and hand dressing, the waste dumped, and the remainder sent for treatment. This means that, instead of a small quantity of rich ore as obtained by the former method, there will result a larger tonnage of lower-grade ore; and it is hoped that the cheaper method of mining and the larger tonnage treated will help to show a profit. Reliance is also placed on a method of handling the sands for cyaniding to reduce costs.

The proposed scheme of treatment is as follows: The ore is first broken in open cutting and the waste hand-picked, the remaining portion being then sent on to a 5-ft. Chilean mill for coarse crushing. The ironstone carrying the gold is expected to pass off from the mill for the most part in a comparatively fine state of division, owing to its original soft and friable nature. The discharge from the mill is over copper amalgamating plates, where the amalgamable gold will be retained.

A separation into slime and sand will be made by spitzkasten. It is then intended to neglect any gold in the slime, as the amount is not expected to be of any consequence, and to utilize the slime to form the walls of a vat or dam in which the sand will be cyanided. For this purpose a concrete floor will be laid on the ground, on which a filter bed will be formed, and the walls or sides of the vats will be made around this bottom by running the slime into a double wall of hessian, supported by rough timber framing. The idea is that the moisture from the slime will filter off to a certain extent through the hessian, leaving the slime, which will gradually build up to form the walls of the vat and will retain the sand and solutions while cyaniding is being carried out, suitable provision having been made for drawing off the solutions.

The idea underlying this scheme is to avoid the cost entailed in emptying ordinary iron or wooden vats when extraction is completed, as in this case it is not planned to remove the sands, but simply to build out fresh cyaniding inclosures as the work progresses, leaving the old one as it stands.

[It would seem probable that the use of hessian, as described, will be found impracticable. The walls could be built of partly dried slime, as is customary in the case of settlement dams.—Editor.]

Foreign Zinc-Smelting Capacities and Prospects

By W. R. INGALLS

A CORRESPONDENT has requested me to communicate to him such information as I might have relative to the zinc-smelting capacity of the world, other than in the United States, and particularly in England, Australia, Belgium, and Silesia, and to give a general statement as to the condition of these different producing centers and the prospects for future increased capacity.

As my reply will probably be of general interest to those engaged in the zinc industry, I publish it as follows:

Germany.—The largest production on record was in 1913, when Rheinland-Westphalia produced 92,852 metric tons, and Upper Silesia 170,119. Probably the smelting capacity was more or less in excess of those figures. The Rhenish-Westphalian smelters depended on Australian ore to a considerable extent. The Silesian smelters received some Australian ore, but in the main depended upon the local ore deposits, which are extensive.

Belgium.—Maximum production, 200,198 metric tons (in 1912), entirely dependent on imported ore. Some of the Belgian smelteries, especially those in the Campine, were operated during the war. With regard to the others, especially those in the valley of the Meuse, my information is that the damage is not much, but that it will be an indeterminate time before smelting can be resumed.

Holland.—Maximum production, 24,323 (in 1913). Operations continued during the war.

Great Britain.—According to my recent advices, smelting capacity at the end of 1918 is sufficient to make 55,000 tons of spelter per annum. With the completion of the new plants now being erected, it is expected that the smelting capacity at the end of 1919 will be 130,000 tons.

France.—Pre-war production was about 60,000 tons per annum. Some of the French plants, especially St. Amand and Auby, are situated in the north, and, being right in the zone of entrenchments, it is not improbable that they have been destroyed. The important works at Mortagne, near Givet, were in the zone of occupation, but, being German owned, they were not damaged. The chief smelteries of France, viz., Noyelles-Godault and Viviez, were out of danger and presumably were in regular operation. It is not unlikely that the French will now take steps to increase their zinc-smelting capacity. Indeed, plans are already being drawn for an electrolytic plant to make about 10,000 tons of spelter per annum in the Pyrenees, but production from that source is not to be expected until 1920 is well along.

Austria.—There are a few zinc smelteries in Austria, but their capacity is small. I know nothing about their present situation.

Italy.—The Societa di Monteponi has a smeltery at Vado Ligure, but its production is small. However, a considerable production of electrolytic spelter is to be expected in Italy in the course of time. I understand that plans are already being made for an electrolytic plant to be erected at Vallauria (San Dalmazzo di Tenda) by the Societa Anonima Elettromineraria of Savona. Other interests are making studies.

Poland.—Three small plants near the Silesian border have a capacity of producing about 10,000 tons per annum. I have no information respecting their present condition.

Norway and Sweden.—Several plants engaged in electrothermic smelting do a considerable business in refining crude spelter, waste products, etc., but do not figure importantly as ore smelters.

Siberia.—A fairly large plant exists at Ekibastus, but having been completed only at about the beginning of evil days in that country, it has not yet made much more than experimental production, and during the last year or two has been idle. However, this plant will probably be a considerable source of spelter some day.

India.—The Burma Mines Corporation is drawing plans for a plant to make 10,000 tons of spelter per annum at Sakchi, which will probably be completed and producing toward the end of 1920.

China.—There is a small production of zinc in native furnaces in China. This country is always a potential producer. A few years ago the erection of a plant there was considered.

Japan.—This country has produced as high as 60,000 tons of spelter per annum, and probably has capacity in excess of that, but finds its main difficulty in getting adequate ore supply. The Australians have not been keen about supplying ore to Japan, but the Japanese will undoubtedly get what they need from Siberia and China in the course of time.

Australia.—There is a small production of distilled spelter at Port Pirie, and of electrolytic spelter at Risdon (in Tasmania). The Risdon production at present is at the rate of about 3000 tons per annum, but it is contemplated to increase it to 30,000 tons as rapidly as possible. The Mount Lyell interests are also planning to produce electrolytic spelter from ore from the Roseberry mine.

Canada.—Trail has a capacity of producing perhaps 15,000 tons of electrolytic spelter per annum, but there has been doubt if economic conditions in British Columbia are as favorable as they ought to be. However, according to its last report, the Consolidated Mining and Smelting Co. has made such improvements in its metallurgical methods that zinc and lead can be produced at a profit on any market that has existed in recent years, providing that costs of labor and materials fall with the prices for the metals. It is said, moreover, that the Sullivan mine has developed into "one of the most valuable mineral deposits in America if not in the whole world."

Mexico.—A small plant (distillery) is under construction at Saltillo. Petroleum is to be the fuel.

The important thing to be deduced from the above summary, it seems to me, is what I have remarked in previous papers, to wit, whereas zinc smelting was for more than a century confined to certain districts where there was experienced labor, and it was considered

venturesome to try any experiments outside of them, there is no longer such hesitation. Thus we now see zinc-smelting projects under way or in contemplation in all parts of the world.

Aluminum and the War

The aluminum industry in 1918 differed in some respects from many other American industries. This is particularly true in that it required no material expansion to take care of war needs, but merely had to be shifted from a peace-time to a war-time basis. The industry was almost entirely engaged in war work, upward of 95% of the product of the principal producer in the United States being used for military purposes. Practically every Government department was a purchaser or a user of aluminum. Some of the amounts used were relatively unimportant from the standpoint of tonnage, but the diversified adoption of aluminum indicates a growing knowledge of methods of handling this metal. The following description indicates some of the more important uses to which aluminum was put:

Aëronautics.—Perhaps in no one field did aluminum play a more important part than in aëronautics. It was used in some of the most important of the component parts of aircraft, and it was found a component of some of the smallest and most delicate instruments. In the airplane, the most obvious and critical part played by aluminum was in the engine. Substantially one-third the weight of the Liberty motor was composed of aluminum. Though no exact figures are at hand, it is highly probable that an even higher proportion of aluminum is used in certain other engines, as, for example, the Hispano-Suiza. Aluminum has been used for many years in automobile engines, but in aircraft work great efforts were made to reduce the weight of the engine to the lowest limits, and to this end aluminum was adopted wherever possible for engine beds, crank cases, pistons, oil pumps, camshaft housings, and numerous other parts. Forty separate parts of the Liberty motor alone were made of this metal, and these parts do not include any of the auxiliary apparatus attached to the airplane. Among the other parts of the airplane where aluminum is used may be mentioned gasoline tanks, fusilage, hoods, cowling, seat backs, and aileron frames. Aluminum is used wherever possible in instruments used on airplanes, such as binocular parts, wireless telegraph and telephone, barometer cases, camera parts, and in range finders.

Although rigid dirigibles have not been adopted in the United States, aluminum is used for important purposes on observation and other types of balloons. All such aircraft has the exterior surface painted with a coat of aluminum paint, to give it a reflecting exterior, thereby obviating changes of temperature as much as possible in the interior of the balloon.

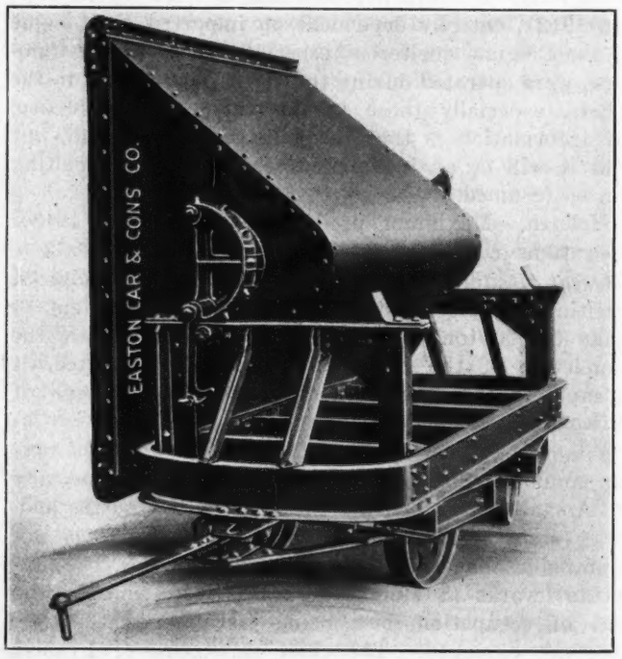
Ordnance.—Every soldier is well acquainted with aluminum from the fact that his mess equipment, consisting of a water bottle, meat pan and cup, is made of this metal, and he is provided with an aluminum identification tag. A small amount of aluminum is also used in gas-mask manufacture.

In the field of explosives, aluminum has found varied uses, as, for example, in ammonal, where aluminum powder is mixed with ammonium nitrate. It is also used in night flares of various sizes, such as are used for illumination or signal purposes. Indirectly, aluminum is of an essential constituent in the production of explosives. In the manufacture of artificial nitric acid, by any one of the several methods employed, aluminum apparatus is used in large quantity. This apparatus takes the form of immense tanks, reaction chambers, pipes, coils, condensers, and similar equipment. All this apparatus requires most careful construction, and must be made, as far as possible, without joints.

A Trackless Trailer

The increasing use of industrial tractors has created an unusual demand for all kinds of trailers. To meet the demand for a car that would not only admit of easy trailing, but would also speed up loading and unloading of loose materials, the new Easton car, here shown, was developed.

It is a four-wheel steer trailer, which will run smoothly over cement, wood, composition or other flooring. All wheels are equipped with roller bearings and may be furnished with rubber or composition tires. Close tracking of trains of these cars is accomplished



A TRACKLESS TRAILER WITH DUMP-CAR BODY

with comparative ease, because both front and rear trucks of each trailer swivel. Trains of six cars will track within three inches and will take a curve of 8 ft. radius, or smaller.

The body of the trailer is distinctive and possesses many features that make for economy and speed in loading and unloading coal, ashes, sand, ore, slag, refuse, and practically every kind of bulk material. Some of the more important features include a special latch for locking the body in a half-dumped position, thus lowering the loading height for hand loading; automatic safety latches; an extra heavy body that dumps clear of the wheels; cast-steel rockers, and extra heavy underframes. The car is built by the Easton Car and Construction Co., of Easton, Pennsylvania.

Use and Abuse of Safety Fuse*

THE only legal definition known of the term "safety fuse" is the one contained in the British Explosives Act of 1876, which reads: "Safety fuse means a fuse for blasting that burns and does not explode, which does not contain its own means of ignition, and which is of such strength and construction and contains an explosive in such quantities that the burning of the fuse will not communicate laterally with other fuse."

Any definition other than the above has no foundation; and the so-called guarantees regarding its performance exist only in the mind of the person quoting them. A fuse manufacturer does not guarantee one single factor of its performance, for the reason that he cannot control the actions of the persons purchasing, storing, and using it; nor can he guard against the many forms of abuse to which it may be submitted.

Choice of Fuse

It is important that attention be directed to some underground conditions that should be taken into consideration, particularly by inspectors when making recommendations regarding types of fuse best suited for the work. Where water drills are in use, the employment of a tape-covered fuse is recommended, the grade depending on the temperature and the amount of water and the nature of the ground.

When acid is present in sufficient quantities to make it necessary to line the mine pumps with bronze, the use of a fuse of the triple-tape type is desirable. It has been clearly demonstrated that the lighter forms of jacketing do not meet this severe condition satisfactorily.

In a poorly ventilated mine, the use of a white cotton-countered fuse should be discouraged, for the reason that this type of fuse is more easily penetrated by the moisture precipitated by slow-moving air currents than is the black-finished type.

Burning Rate Influenced by Transportation and Storage

Fuse in transit may be easily spoiled by being allowed to come in contact with moisture, or with oily or greasy substances, or by being exposed to the direct rays of the sun for any considerable time.

Inspectors should caution superintendents or foremen that fuse which has had oil, gasoline, or distillate spilled on it, or that has been carted to the mine during wet weather without being protected, is likely to be the cause of misfires.

Proper storage of safety fuse is a vital factor. On every case is found the caution, "keep contents cool and dry." It is absolutely imperative that this be followed to the letter. Fuse which has been stored underground is never in prime condition.

It should not be stored near a boiler, furnace, hot steam pipe, or lighted stove. Exposure to heat for only short periods may result in misfires, or may retard the rate of burning, and so greatly increase the liability to cause hold-backs. Fuse that becomes overheated to such a degree that it is absolutely spoiled is harmless, but fuse that has been overheated only to such a point that the powder train has become partly saturated with the materials that were originally put on as a water-resisting covering is extremely likely to cause serious trouble, owing to irregular burning.

Fuse stored in temperatures ranging from 45° to 75° F., in buildings that are dry, will remain in good condition for a considerable time. It is, however, always well to restrict this storage period to a matter of months. Sometimes lack of surface buildings forces temporary storage of fuse, in its original cases, underground. The underground storage place should be well ventilated and cool. A drift or tunnel in which conditions are such that hay or grain will become mouldy is absolutely unfitted for storage of any explosive.

Storage of fuse in a damp place retards its burning speed. Even if precautions are taken to attempt to re-dry the fuse before using, it will be found that the burning rate has slowed down and is irregular. This irregularity tends to increase the liability of misfires.

It should be remembered that fuse waterproofing is quite as effective in keeping dampness in as it is in keeping external water out, and for this reason the thorough drying of fuse that has once been wet is indeed difficult. Experiments have proved that the burning speed of fuse that has been stored in a damp place varies from 17 to 45% from normal.

Exposures to comparatively high or low temperatures for long periods of time retard the burning speed. Cotton-covered types of fuse do not exhibit the marked changes that the tape-covered types do. Fuse warmed near a stove showed variation in burning time up to 28 per cent.

When considering the matter of uneven burning time of fuse, it should be remembered that poor storage and the placing of the fuse under uneven stemming[1] and powder loads, in the same round of holes, are responsible for most of the complaints.

Main Cause of Misfires

Misfires may, for the sake of reference, be placed in three subdivisions: (a) Preventable, (b) non-preventable, and (c) misfires due to mishandling which extreme care in manufacture cannot guard against.

Preventable misfires are caused by improper capping, sharp tamping material, wet fuse ends, poor storage. the use of oil, light grease, or turpentine-varnish as a waterproofing material, non-lighting of all fuse in a round, using, for primers, fuse that has been crushed or walked on, and the improper spacing of holes.

Non-preventable misfires are caused by defective fuse and destruction of fuse by water pressure caused by firing holes in dense ground filled with water.

Misfires due to mishandling are often the result of cutting fuse with a dull instrument, cutting fuse at a slant, using a narrow-jawed, ring cutting crimper, the non-seating of fuse against the cap composition, using fuse for a sling or belt before attempting to use it for its normal function, placing a foreign substance between the ends of the fuse and the cap composition,

*Abstracted from Bulletin No. 9 of the Industrial Accident Commission of the State of California.

[1]Tamping.

and the use of oil, grease, gasoline, distillate, or a paint containing turpentine or linseed oil in the mistaken idea that it will exclude water from the fuse.

Additional Causes of Misfires

Certain causes of misfires have been overlooked by the underground staffs of properties registering complaints. Such causes include the following:

1. Fuse powder has been knocked from the end of the fuse by the use of a wire brush, in a misguided attempt to clean the end of the fuse before it was inserted in the cap.
2. Axle grease had been smeared on the entire 50-ft. length of the fuse before it was cut into the desired lengths for blasting.
3. A mixture of black powder and guncotton that had been allowed to become wet was placed in the caps before the fuse was inserted.
4. Fuse had been placed in a warm room for several days before it was used, after being capped and dipped, in some cases in light grease and in others in cable dressing.
5. Fuse had been capped and hung submerged in a barrel of oil several hours before using.
6. Fuse had been allowed to hang on nails, underground, for days and even weeks before use.
7. Fuse was cut, capped, and then piled on the floor of the drift for weeks before an attempt was made to use it.
8. Large quantities of fuse were hung on nails, for long periods of time, before use. This caused a fracture of the powder train.
9. Primers were placed over the crossbar of the cage, and jerked down sharply to hold them on the bar while being lowered into the mine. The jerking was sufficient to fracture the powder train of the fuse.
10. Defective caps. These caps had been spoiled by exposure to steam and moisture.

Another cause of misfire, not so generally recognized as it should be, is the sweep of the air returning to place during blasting operations. This feature is most noticeable in development work, and particularly in massive ground. The displaced air returning to place causes several things to happen. The most common is the throwing of powder out of untamped holes; another, in wet holes, is the driving of the water with great force into the powder cartridges. This at times will so completely surround the powder with water as to cause an imperfect shot. Still another is the destruction of the fuse in the hole that is wet through saturation.

Causes of Uneven Burning

A common cause of uneven burning is that a mining company often allows a warehouse man to pile an incoming shipment of fuse in front of the shipment already in stock. Where this is done trouble results for the reason that with age fuse slows down in burning speed. An attempt to use fuse that has been stored for months in a warehouse in combination with a fresh shipment has been known to spoil many a round of holes.

Methods and materials used in stemming cause variations in burning time as high as 80%. The normal speed on the Pacific Coast is 40 sec. per ft., when the fuse is burned in the open at sea level. Investigation of reports of uneven burning time in development work brought to light a curious circumstance: In a majority of the cases investigated it was discovered that the holes that were reported to have gone out of their turn, and thus spoiled the round, were the lifters.

Questioning of the miners who had loaded and fired such rounds showed that they all believed that "the fuses in the lifters had to stand the jar and vibration of all the other holes in the same round, and for that reason should be located as deeply and tamped as securely as possible." Following that line of argument, the miner loaded the primer in the point (bottom) of the lifter and also tamped it. The lifters were usually the only holes in the round that were carefully tamped, and the placing of the primer in any one of the other holes was largely problematical, usually at some point in the hole that suited the fancy of the particular miner loading the hole. The result of this method of loading was that the lifter would fire out of rotation and spoil the round. The speed of the fuse in the lifters was governed by the pressure exerted on it for considerable length by the explosive load and the stemming. This caused rapid burning.

Although the mining company, as a general practice, should not attempt to settle the much-mooted question of the most desirable position of a primer in a hole, it should insist that, if good results are expected from safety fuse in regard to even burning, the primers in all the holes in the same round should be subjected to about the same pressure on relatively equal lengths.

Another cause for uneven burning for which the fuse is in no way to blame is the improper spacing of holes. This practice often causes holes to fire out of rotation, owing to ground squeeze created by firing holes drilled too closely together. If a mine inspector receives complaints that lifters are missing in wet ground, he should carefully determine whether too close spacing of holes, instead of defective fuse, is not responsible for the trouble. Where the holes immediately above the lifters are drilled too close to them, their bursting causes the water in the lifters to drive laterally through the fuse, in many cases destroying it. This trouble can easily be remedied in wet and damp ground by putting a reasonable burden on the lifters.

Elimination of Misfires

Having stated the causes of many misfires, let it be assumed that the fuse has been properly made and stored. What, then, may be done to eliminate much of the trouble? Consider first the making up of the fuse into a primer. (The term primer for the purpose of this paper may be considered to be a capped fuse.)

The first operation is cutting the fuse with a sharp instrument, square across. Never fail to cut off a fraction of an inch from the end of a fuse that has been exposed to the air for any length of time, and never cut a fuse on a slant, as this may cause the sharp point formed by this kind of cut to double over in the cap barrel. This would cause the fire from the fuse to hit the side of the cap instead of reaching the cap composition. Next, care must always be taken to press the end of the fuse lightly against the cap composition before crimping. This precaution must be used so that no air space is left between the end of the fuse and the cap composition. A large percentage of misfires in

mining is caused by not following this simple but vital practice. For the benefit of many persons who do not know the reason for the necessity of observing great care in this matter, the following explanation is offered, together with a simple demonstration to prove the contention:

Burning fuse generates about one and one-quarter liters of gas for each foot, and this gas is known, by analysis, to contain, roughly, 23% carbon monoxide and 33% carbon dioxide. An indefinite volume of the gases generated by the burning fuse precedes the fire in the fuse, through the powder train. The distance is governed largely by the jacket of the fuse and the condition under which the fuse is used. When fuse is burned in dry ground, unstemmed, the gas precedes the fire by only a short distance, but when burned in a wet hole where the water keeps the fuse jacket cool and holds down the side spit, the gas generated by the burning fuse is forced ahead of the fire, in many instances, as far as 24 inches.

It can readily be seen that under these conditions, if an air space is left in the cap barrel, and the cap is crimped tightly enough to retain the fire-extinguishing gases in the unoccupied space, the spit from the inclosed fuse end will not shoot forward with its usual heat and energy, but will simply bubble feebly and will not come in contact with the cap composition with sufficient heat to fire it.

A simple way to demonstrate this matter of gas preceding fire in a fuse is to take a basin of clear water, submerge 2 ft. of a 3-ft. piece of fuse, and light the dry end. Before the fire in the fuse reaches the water level, gas will be observed coming from the submerged end. By the time the fire reaches a point about 9 in. from this end, the flow of gas will have become continuous and relatively large in volume.

For crimping a cap to the fuse, only a broad-jawed crimper should be used. This type of tool seldom cuts a cap shell. In cold weather fuse should be warmed slightly before uncoiling is attempted. In outside work fuse should be protected from dampness and the direct rays of the sun when circumstances force its being exposed to the weather for any length of time.

When fuse is to be used in wet work, it is well to seal the joint of cap and fuse with a suitable preparation. For this purpose P & B roofing paint having an asphaltum base, pine tar, and Celakap are recommended as the most suitable.

Erroneous Theories

Some beliefs that time and constant repetition have caused to be accepted, but which are erroneous, are worth repetition.

The exterior appearance of a fuse is often taken as a reliable indication of its quality. Fuse of dingy appearance, however, is often excellent in quality. Some grades of fuse waterproofing will absorb the white material put on the outside, causing the fuse to become a dirty yellow color. This in no way affects the burning quality. A test would easily determine the quality of the fuse and avoid unnecessary complaints. Contrary to popular belief, the center thread is not chemically treated to assist in the burning quality of the fuse. The absence of the center thread will not alter the burning speed of the fuse; its function is merely to make a more certain flow of powder in the fuse-making machine.

It should be recollected that safety fuse is not intended to be tied into knots, nor is it designed to withstand other unnecessarily rough or careless treatment. If carefully handled, it is expected to serve as a reliable means of conveying fire to the charge. In only rare instances will safety fuse fail to perform its function if common sense is exercised in its use.

China's Richest Iron Mine

An agreement has been practically concluded with the Japanese government under which the immensely valuable iron mine of Feng Huang Shan, near Nanking, will be worked by the Chinese government, and steel will be manufactured by Chinese and Japanese, the latter providing 20,000,000 yen to carry out the work, states the *North China Daily News*. This means that the Japanese will acquire control of the total output of the mine. At present they are pressing for the right to take part in working the mine, and, pending a decision on this point, the final signature of the agreement is temporarily delayed. The Chinese have always steadfastly refused to part with this mine, and although the Japanese have long been anxious to obtain it, it is thought that the agreement has been made possible only by a resolution of the Chinese Cabinet transferring the control of the mine from the Ministry of Agriculture and Commerce to the Ministry of War. The Feng Huang Shan mine is the largest single deposit of iron ore in China. It is estimated to contain 50,000,000 tons of available ore.

Effect of Mining Patents

By A. L. H. Street*

In a suit involving priority of rights in a lode mining claim, the United States Circuit Court of Appeals, Ninth Circuit, lately declared that any invalidity in a certificate of location was cured by the issuance of patent covering the mining claim, the patent having remained unassailed (Butte & Superior Mining Co. *vs.* Clark-Montana Realty Co., *248 Federal Reporter, 609*).

The decision follows the general rule of law, applicable to the Interior Department, that the finally expressed judgment of the department is conclusive as against collateral attack. Unless and until direct proceedings are brought to annul or limit the decision of the department in a given matter, the adjudication concludes dispute as to the existence of all facts upon which the decision legally depends.

The court cites a decision of the United States Supreme Court holding that a patent to a lode claim in Colorado carried, by conclusive implication, proof that a mineral vein had been discovered and that there had been compliance with all statutory prerequisites to valid title. Another decision of the same high court is cited on the point that issuance of a final receipt to a locator operated as a binding judgment that the location was valid, that assessment work had been completed, and that there were no adverse claims.

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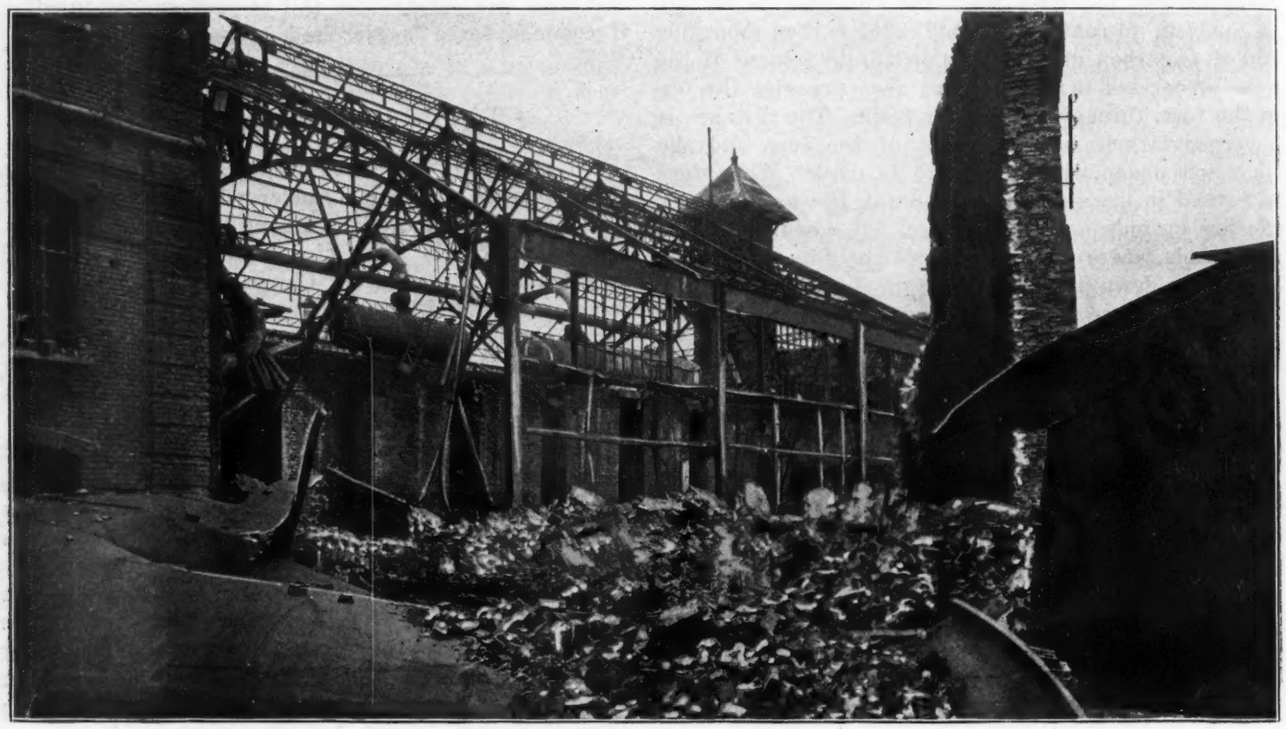
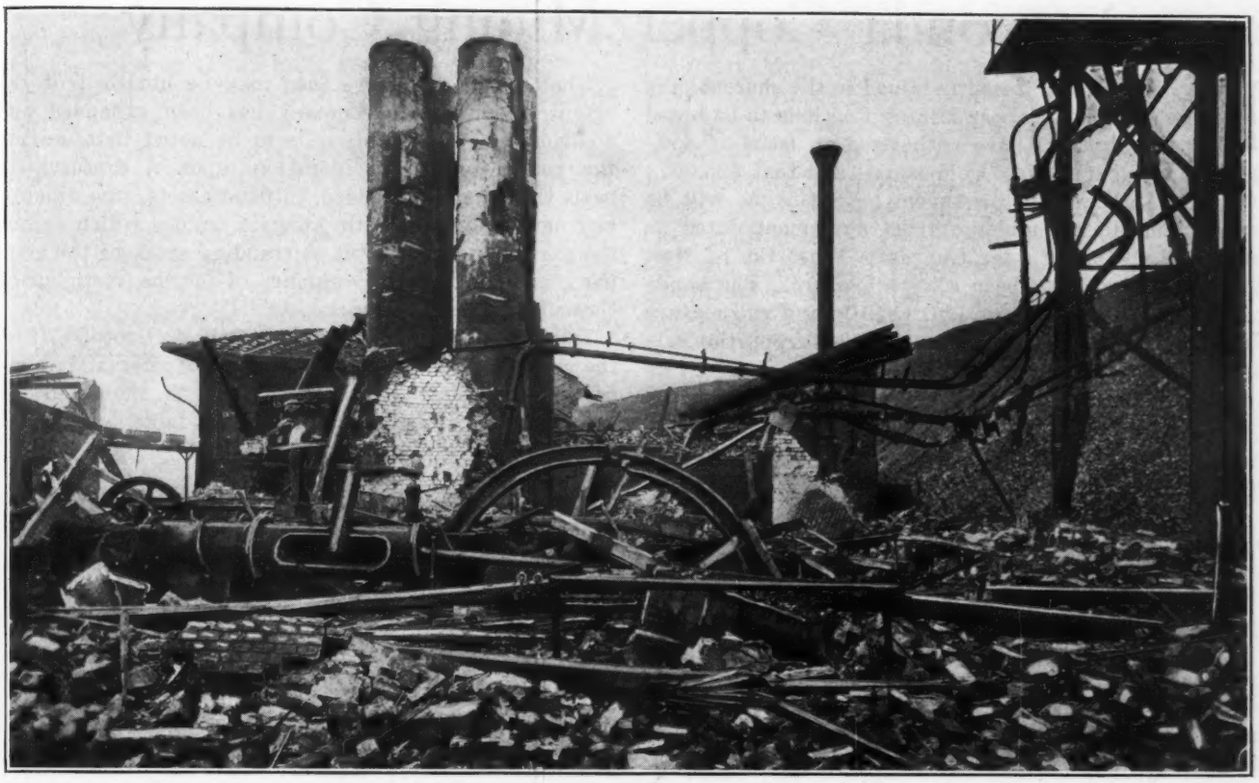
German Vandalism at French Mines



GERMAN DESTRUCTION OF MINE MACHINE SHOP AT DROCOURT, PAS DE CALAIS, FRANCE

REMAINS OF SURFACE PLANT AT COAL MINES AT DROCOURT, FRANCE



DESTRUCTION OF COMPRESSOR PLANT AT COAL MINES OF ANICHE, PAS DE CALAIS, FRANCE

HEADFRAME, SHAFT COLLAR, AND BUILDINGS AT ANICHE, DEVASTATED BY GERMANS

Anaconda Copper Mining Company

IN A PAMPHLET recently issued to the shareholders of the Anaconda Copper Mining Co., it is to be noted that the directors have authorized an issue of $50,000,000 ten-year secured gold bonds, and that $25,000,000 of said bonds, to be known as Series A, will be issued immediately under a trust agreement dated as of Jan. 2, 1919, with the Guaranty Trust Co. of New York. The issue has been sold to bankers. The bonds of this series bear date of Jan. 1, 1919, and will mature Jan. 1, 1929. The proceeds obtained from the sale of these securities are to be used for the equipment of the properties of the Andes Copper Mining Co. and the Santiago Mining Co., and to replace in current account part of the earnings which have been invested by the company.

It is purposed to proceed, as expeditiously as is consistent with prevailing conditions, with the construction of plant facilities for the South American properties, so that they may, at as early a date as is practicable, begin production, and thus contribute to income.

The method of financing decided upon was adopted for two reasons: First, because it was deemed more advisable to raise the necessary funds by a loan, which can be largely repaid from the earnings of these properties, when equipped, than to add permanently to the capitalization of the company. The shareholders will thus be assured of the profit resulting from these new enterprises, and the company will be strengthened by the addition of new mines of large tonnage to replace ore extracted from its producing mines. Second, because to continue to finance from earnings the requirements mentioned, properly chargeable to capital account, would impose an undue burden upon present shareholders.

ANACONDA COPPER MINING CO. EARNINGS

Year	Amount	
1913	$12,050,857.41	
1914	9,635,216.05	
1915	18,596,384.55	
1916	57,941,835.29	
1917	39,721,188.39	
Nine months to Sept. 30, 1918 (estimated)	27,115,499.01	
		$165,060,980.70

DIVIDENDS

Year	Amount	
1913	$12,997,500.00	
1914	9,077,500.00	
1915	9,325,000.00	
1916	17,484,375.00	
1917	19,815,625.00	
To Sept. 30, 1918	13,987,500.00	
		$82,687,500.00
Balance		$82,373,480.70

In connection with the issuance of these securities, the directors have submitted a summary of the combined results which have been obtained by the company and its subsidiaries (whose outstanding capital stocks are owned entirely by it with the exception of directors' qualifying shares), exclusive of the South American companies, which will be dealt with separately, during the period embraced from Jan. 1, 1913, to Sept. 30, 1918, the last-named date being the latest to which results can be ascertained with accuracy. This period covers not only the era of extraordinary industrial activity incidental to the conduct of the war, but also the period of rapid enlargement and expansion of the business of the company.

That a comprehensive idea may be obtained of the extent to which the company has been expanded and additional assets added, it is to be noted that, during the period under consideration, upon a conservative basis there has been added, in fixed assets, investments, and new mines in South America, values which exceed the par value of the total outstanding stock of the company, as shown by the summary of income, distribution thereof, and assets acquired.

During the period from Jan. 1, 1913, to Sept. 30, 1918, the company earned, after payment of interest but before depreciation charges, the amounts shown in the accompanying earnings and dividends table.

Fixed Assets

The fixed assets of the company and its subsidiaries show a substantial increase, the total under this heading as of Sept. 30, 1918, aggregating the sum of $155,687,252.75, an increase during the period of $59,109,457.61. The principal items of increase so classified consist of the following:

Metal mines and mining claims, coal mines and coal lands, and lands for reduction works, refineries, etc.		$6,598,215.51
Buildings, machinery, ventilating, pumping and miscellaneous equipment at mines	$3,639,493.23	
Buildings, machinery, equipment, etc., at reduction works and refineries:		
Washoe reduction works, Anaconda	11,938,868.35	
Great Falls reduction works	10,183,741.22	
Tooele and Miami plants	7,445,705.21	
Raritan Copper Works	8,326,771.33	
Miscellaneous subsidiary companies	1,575,562.81	
Miscellaneous subsidiary departments	756,288.37	
Total	$43,866,430.52	
Against the foregoing increase in fixed assets there has been charged for obsolescence and depreciation a sum aggregating	5,658,019.12	
Leaving a net increased amount of		38,208,411.40

Investments

Inspiration Consolidated Copper Co., 250,900 shares @ $32.72 per share	$8,210,433.02	
Greene Cananea Copper Co., 59,600 shares @ $37.94 per share	2,261,437.41	
Arizona Oil Co., amount paid on 8160 shares	780,000.00	
Miscellaneous stock investments, Liberty bonds, etc.	3,050,960.27	14,302,830.70
Making the total as given above		$59,109,457.61

NOTE—The foregoing statement of increases in fixed assets does not include the South American properties, upon which, to Sept. 30, 1918, there had been expended $15,234,914.90.

In dealing with the general subject of earnings and fixed assets it is necessary to do so on a combined basis. That the shareholders, however, may be given a clear idea of the results obtained from expenditures made by the company in additions and extensions to its own plants and in acquiring its principal constituent companies and outside investments, the following memoranda are submitted:

The improvements and additions which have been made to the plants and methods devoted to copper recovery at the Washoe reduction works and the Great Falls reduction works have demonstrated that under conditions of cost which existed during the years 1911, 1912, and 1913, and the pre-war prices which prevailed for metals, these additions and improvements in prac-

tice would add approximately $8,000,000 a year to the net earnings of the company. Included in the above amounts spent at Great Falls and Anaconda, as shown under the heading "Fixed Assets," are expenditures made upon the new electrolytic zinc plant of the company. The total sum expended was $6,852,923, and the profit resulting from its operation during 1916 and 1917 was $5,250,201.

From the principal subsidiary companies and investments, the following results have been obtained during the period:

Inspiration Consolidated Copper Co.		
Cost 250,900 shares @ $32.72		$8,210,433.02
Dividends received	$4,544,700.00	
Annual return at present rate	2,007,200.00	
Greene Cananea Copper Co.		
59,600 shares @ $37.94		$2,261,437.41
Dividends received	$1,130,600.00	
Annual return at present rate	476,800.00	
International Smelting Co.		
Book value 120,000 shares		$12,000,000.00
Dividends received	$3,600,000.00	
Earnings from May 27, 1914, above dividends	974,864.73	
Total	$4,574,864.73	
International Lead Refining Co.		
Book value 7500 shares		$750,000.00
Earnings from May 27, 1914	$216,567.21	
Raritan Copper Works		
Book value 20,000 shares preferred and 40,000 shares common stock		$6,994,773.68
Dividends received	$3,030,000.00	
Earnings from May 27, 1914, above dividends	921,739.09	
Total	$3,951,739.09	
United Metals Selling Co.		
Book value 50,000 shares		$5,741,249.13
Dividends received	$3,700,000.00	
Earnings from April 1, 1915, above dividends	564,813.35	
Total	$4,264,813.35	

An appraisal of the securities enumerated at market value for those dealt in by the public, and upon the basis of actual value of assets owned by subsidiaries, where not so dealt in, would increase substantially the amounts at which they are carried on the books of the company. That it has been decidedly to the advantage of the shareholders to make the above investments has been, it is believed, amply demonstrated by the returns realized and the present prosperous condition of the business of the companies whose securities have been acquired.

Current Assets and Liabilities

The enlarged scope of the business conducted by the company has necessarily resulted in increasing materially its accounts of both current assets and current liabilities. In connection with its large custom gold, silver, copper, and lead smelting and refining business, and its zinc business, large sums of money are required to enable it to purchase and reduce ores, to carry stocks of metals, and to provide sufficient working capital to enable its operations to be conducted upon the present scale. The following table shows the current position as of Sept. 30, 1918, as well as the change during the period under consideration:

	Sept. 30, 1918	Increase
Current assets	$73,000,000.00	$44,500,000.00
Current liabilities	41,400,000.00	33,300,000.00
Net current assets	$31,600,000.00	$11,200,000.00

South American Properties

The company has expended, through its South American subsidiaries, to Sept. 30, 1918, the sum of $15,234,914.90. Included in this amount are all items of examination, exploration, and development on every account, and also the purchase price paid for and all expenditures thus far made in connection with the properties of the Andes Copper Mining Co. and the Santiago Mining Co. Development work on these properties is being pushed as expeditiously as possible.

The Andes Copper Mining Co. has completed its wharfs and warehouses at Barquito, its Pacific port, has constructed an aggregate of 58 miles of main-line railroad, is working on the section of railway from mill site to mine, a distance of 5.5 miles; office buildings and houses for the accommodation of employees are rapidly being completed; a temporary power plant, transmission line from coast to mine, water supply line, and other necessary improvements, are under construction, and definite plans for permanent plant and equipment are now in course of preparation.

It is estimated that, in addition to the amounts which have been expended as above, there will be required to fully complete the equipment of these properties for an annual production of 140,000,000 lb. of copper, an additional sum of approximately $30,000,000.

The South American mines have not as yet been fully explored, but sufficient ore has been developed to insure, upon a basis of a cost of 9c. per lb. of copper, which is believed to be liberal, and a price of 15c. per lb., which is conservative, aggregate net earnings in excess of $100,000,000 within a period of 12 years after reaching the output for which plant and equipment are now being designed. Production will, it is estimated, reach the above amount of 140,000,000 lb. per annum within three years after orders for equipment have been placed, which will be done as soon as shipping facilities are assured. The minimum value of these properties may be indicated in terms of present worth, which it is calculated, after making provision for the complete amortization of all capital requirements, is as of Jan. 1, 1919, in excess of $60,000,000 net, taking only developed ore into consideration.

Summary

The authorized capital stock of the company is 3,000,000 shares, which at $50 per share totals $150,000,000 The outstanding stock is 2,331,250 shares, having a par value of $116,562,500.

Within the period under consideration, there has been added to the company's assets the following:

Fixed assets	$44,806,626.91
Investments	14,302,830.70
Mining properties in South America, having a present worth in excess of all capital requirements	60,000,000.00
Total	$119,109,457.61

Against this increase in assets there has been issued but $8,250,000 par value of stock, which was paid to shareholders of the International Smelting and Refining Co., in part consideration for the acquisition of the shares of that company in 1914.

British Electric Steel Furnaces numbered 140 at the end of 1917, according to a report recently read before the Staffordshire Iron and Steel Institute, says *Iron Age*. These varied in capacity from one-half ton to 15 tons, and nearly one-half were in the Sheffield and Rotherham district. Furnaces of the arc type have established their superiority from a commercial point of view. It is stated that there are at the present time one or more 25-ton furnaces under construction.

Mining in Idaho in 1918

By R. N. BELL*

EXTREME shortage and poor quality of mine labor during 1918 caused a serious slump in the metal output of Idaho compared to that of the preceding three years. This shortage was particularly felt in the Cœur d'Alene district, which produced 90% of the lead-silver and zinc output of the state. The mines of this region have abundant ore reserves, owing to a well-advanced policy of development instituted by the big mines several years ago, but it was impossible to get the necessary labor. According to the best estimate possible at this time, the metal output of the state in 1918 was as follows: Lead, 296,803,425 lb.; silver, 9,203,897 oz.; zinc, 51,691,000 lb.; copper, 5,142,000 lb.; and gold, 24,827 oz. In 1917, the output was as follows: Lead, 395,000,000 lb.; silver, 12,496,000 oz.; zinc, 96,000,000 lb.; copper, 7,282,000 lb.; and gold, 53,000 oz. These figures were closely approximated in 1915 and 1916. The draft, enlistments, and war industries were directly responsible for the scarcity of labor.

The Bunker Hill & Sullivan company, the largest in the state and with a normal crew of 1000 men, contributed 300 men to the war's demands, and all other big mines of the state experienced a drain that reduced normal crews 30 to 50%. The Cœur d'Alene district was about 2000 men short throughout 1918. The high wages prevailing attracted plenty of common labor, but good miners were scarce, and the labor turnover was excessive. The progress of dead development work was retarded, as a result, in the big mines, and new development enterprises were largely at a standstill owing to high costs. From the start of the Great War to the present time, the big mines have been largely operated on proved ore resources. What new work has been accomplished, however, has shown marked results, especially as to persistency of ore channels.

Ore Persists in Deep Levels of Bunker Hill

The persistency is particularly true of the Bunker Hill & Sullivan mine, where sufficient dead work was done at the deepest point, which is 4600 ft. on the dip and 3400 ft. vertically below the surface. Here the main ore channels were intersected and even the narrower ore-bearing fissures were found to be in normal condition as to position and character, with no sign of deterioration or exhaustion.

The Hecla mine, at Burke, likewise is making the best showing of its history in its deepest working levels. The Hercules mine, in its three new stoping levels below the lowest drainage entry, still displays its characteristic large stope faces of galena. Stations are being cut at the 2800 and 3000 levels, preparatory to crosscutting and drifting.

At the Tamarack & Custer Consolidated, one of the newer producers, crosscutting and drifting on new ore courses gave good results in 1918. This mine, like the Hecla, now exhibits zonal proportions, including a trunk channel up to 40 ft. in stoping width and 1400 ft. long, with three closely parallel veins, recently opened, of good length and width. It made a daily output of 450 tons throughout 1918, with an underground crew of 120 men; and has a present depth of 1200 ft. It is under the control of the Day brothers.

With the return of the men from the Army and Navy and of war-industry workers, the labor situation materially eased up in December, but the rapidly falling lead market and apparent glut of metal, with high operating costs still prevailing, cast a gloom over the industry. If the period of reconstruction to normal business conditions can be sanely accomplished, the Cœur d'Alene district can continue to maintain its standing as a lead-silver producer for years, as it has weathered the war draft in good fashion.

Idaho Continental Develops New Resources

One notable improvement in lead-silver resources was that made at the Idaho Continental mine, where a limited amount of new development demonstrated that three supposedly separate oreshoots were really one persistent channel. The extension beyond a short fault of several hundred feet of good stoping ground to the south was also revealed, which, together with the proved persistency of the vein in good ore croppings 2000 ft. north of the main lower-adit tunnel portal, indicates a persistent channel of galena nearly a mile long. This mine is situated 26 miles from the railroad, at Porthill, in Boundary County, near the Canadian line. Its isolated position has greatly retarded its progress. In 1918, the property shipped by motor trucks, over a rather difficult route, concentrates and crude ore containing 7,000,000 lb. of lead with 129,000 oz. of silver.

The ore of the Idaho Continental is similar to that of the Cœur d'Alene district, occurring in a clean quartzite formation resembling the famous ore-bearing Burke horizon of that district. A wagon road has been built on a uniform maximum grade of 4%, with a view to future equipment with a Shay railway.

North Star Ore Difficult To Treat

In the Wood River district of Blaine County, the Federal Mining Co., of Wallace, continued its efforts until September to solve the metallurgical problem involved in treating the ore from its North Star mine. By that date, it had its 150-ton mill working favorably and was producing 40% zinc concentrates. This mine developed zinc-lead ore carrying about 14% zinc, 8% lead, and 8 oz. of silver in bodies up to 20 ft. thick and proved for several hundred feet in length and depth. This interesting deposit is complicated from a metallurgical aspect by the fact that it contains an excessive proportion of arsenical iron sulphide and some antimony. In September, the slump in the zinc market made it practically impossible to market the product, and operating was suspended. About a year ago this same company was fortunate in picking up the Independence mine, which is on a vein parallel to the North Star less than a mile away.

The Independence differs from the latter, however, in that its ore is practically free from zinc and is easy to treat, consisting principally of sheared quartz

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with coarsely crystalline galena and little pyrites. The property has been developed with six levels, its main feature being an oreshoot about 80 ft. long with a maximum width of 30 ft. It is equipped with a small mill, and its old development has been materially extended, so that with little stoping, it has produced 25 tons daily of high-grade shipping mineral as concentrates and crude ore, the latter carrying 30 to 50% lead, with over two ounces of silver per unit of lead. The enterprise gives promise of success with further development. It is purposed to crosscut from the deep level of the Star mine to the Independence vein, a distance of about 3000 ft., which will afford a better outlet to the property and access to a new mill.

Empire Mine Output Cut Fifty Per Cent

The Empire mine, in Custer County, recorded a 50% reduction in output in 1918, as compared to that in 1917, attributed to labor and car shortage, and made a yield of about 30,000 tons of crude shipping ore, containing about 5% copper, with several dollars in gold and silver. This property produces a siliceous fluxing ore that finds a ready market with the Salt Lake Valley smelters. A new aërial tramway, three miles long, was completed and put in operation during 1918, taking the place of the more expensive Shay road, which was six miles long on a 6% grade. The mine continues to exhibit its normal ore resources at the Albert tunnel level, 700 ft. deep, but the development at the 6000-ft. tunnel entry, cutting the ore 1600 ft. deep, was retarded by a shortage of labor.

Lessees at the Red Bird mine, near Clayton, in Custer County, shipped 40 carloads of 40% lead ore, with 30 oz. of silver.

In the Gilmore district, the Pittsburgh-Idaho mine completed the installation of a 250-hp. Diesel-engine plant for operating its compressor, hoist, and pumps, The new 700 level was opened, but an excessive flow of water was encountered that retarded production. This has now been substantially overcome, and the new level is producing better ore than any level above. The ore is still completely oxidized, indicating that, in spite of the water encountered, permanent water level has not yet been reached, and that the water troubles are due to leakage from a 6000-ft. drain tunnel that crosses the ore course at the 400 level near the shaft, a condition that may be cured by deepening and cementing the drain, and thus relieving the excessive pumping costs involved.

The Latest Out mine, adjoining, made one of the best productions of its history during 1918. This company is also operating the adjoining Gilmore company's property under lease through the long drain tunnel at a depth of 900 ft. under the surface of the mountain, where rich lead-silver ore has been found. A number of carload shipments have been made from the latter property.

New Copper Developments at Harmony Mines

Fifty miles west of Gilmore district, interesting new copper developments were made at the Harmony mines, the Pope-Shenon mine and the Torney mine. These properties are three or four miles apart on the same general strike, the ore occurring in pronounced sheared fissure veins, inclosed in siliceous schisty walls of pre-Cambrian formations resembling the Prichard formations of the Cœur d'Alenes. They each exhibit ore courses varying from 2 to 10 ft. wide, with average values of 3 to 4% copper. The three together produced eight carloads of crude shipping ore in 1918, the smelter returns ranging from 5 to 17% copper. All ore is conveniently situated within five to ten miles of the railroad at Salmon City.

An interesting deposit of zinc-lead mineral is being developed on Carmen Creek 10 miles east of Salmon City and is being equipped with a 200-ton mill. This exhibits a surface exposure, 600 by 900 ft., of what is believed by the owners to be a siliceous igneous formation. Dozens of shallow surface cuts over the area, 15 ft. deep at the maximum, show rich bands, up to two or three inches thick, of fairly clean zinc sulphide, with galena and disseminated iron pyrites. Zinc and lead are found also throughout the body of the rock, with some gold and silver.

Blackbird District Yields Cobalt Ore

An extensive group of claims, having cobalt sulphide ore, is owned by the Haynes-Stellite Co., of Kokomo, Ind., in the Blackbird copper district, 36 miles west of Salmon City. The property was operated throughout 1918 with a crew of 12 to 15 men. It is equipped with a 10-stamp mill and concentrating tables for preliminary testing purposes. High-grade concentrates were produced and shipped to Kokomo for further treatment. A new adit tunnel was driven several hundred feet on the strike of the main orebody, together with systematic crosscuts. A zone of cobalt-sulphide ore, of milling grade and from 60 to 100 ft. wide, was thus proved, as well as a course of high-grade ore 5 to 10 ft. thick.

The Blackbird district, in which this cobalt ore occurs, has been better known in the past for its copper prospects, the sulphide ore all being associated with cobalt and a little nickel. The ores occur in some instances as broad disseminations in black siliceous schist, grading at the northwest end of the district into eruptive granite and extensively intruded with dikes of diorite-diabase and minette. The district is isolated, being 36 to 40 miles from the railroad terminal at Salmon City. It can be made easily accessible by auto truck or railroad by way of Salmon River Canyon and Big Creek, the distance being about 80 miles.

A few miles south of the Blackbird district, at Prairie Basin, interest was stimulated during 1918 in the development of a gold-tin placer deposit, which has so far yielded 130 lb. of tin concentrates assaying 30% tin and $20 gold. Water is abundant for hydraulicking, and it is purposed to operate the property in 1919.

In Latah County, activity was revived during 1918 in the mica prospects of Mica Mountain, 30 miles east of Moscow. This district contains pegmatite zones up to 20 ft. thick, with segregations of high-grade mica "books" up to 10 x 18 in. in size. One of these properties has been developed and is 200 ft. deep and 500 ft. long. It has produced 50 cars of mica, which turned out 5% first-class sheets, 15% second class, and the remainder scrap. These coarse pegmatite deposits are numerous in the district.

The high price of quicksilver resulted in the further

development of quicksilver deposits in the Yellow Pine mining district in central Idaho, 70 miles east of Cascade on the Long Valley branch of the Oregon Short Line Ry. The discoveries were originally made at the time of the Thunder Mountain boom, and lie only 10 miles east of Roosevelt, at the head of two tributaries of the South Fork of the Salmon River known at East Fork and Cinnabar Creek.

The original discoveries were made by Pringle Smith, who has done much development on a zone showing exposures of well-fissured ground on a quartzite-limestone contact. Cinnabar is disseminated throughout, with lines of enrichment in places several inches thick, the latter ore running as high as 5% quicksilver. There are also several exposures from 4 to 10 ft. thick, the ore running 20 lb. of quicksilver per ton. Later, the Fern mine was located and developed by Theodore Van Meter and associates, supported by local Boise capital.

A 100-ft. tunnel was run on the Fern property, developing a steep fissure vein, a foot to three feet wide, of high-grade cinnabar ore containing, on the average, 1% to 5% quicksilver. A small Johnson-McKay furnace was built on this property and operated for a short time last summer, producing 22 flasks of quicksilver, which were shipped to California and sold on the open market. The enterprise was poorly handled, and the extent and richness of the deposit remain to be proved.

As a result of these operations, a boom was started, and many claims adjoining the properties to the north and south were located. Other quicksilver prospects were discovered, but little development was accomplished before the close of the season. Two or three small crews are operating in the district this winter. Its geology is decidedly favorable to the occurrence of quicksilver ore, and it is possible that a productive district will ultimately develop at this point.

American Mining Congress Organizes California Chapter

Two hundred mine owners, operators, and oil men met at the Palace Hotel, San Francisco, on Jan. 15, at 10 a. m., having been called together for the purpose of organizing a California chapter of the American Mining Congress. From the registration it was apparent that the interest was not merely local, as Nevada, Oregon, Utah, Arizona, and Colorado were represented, and later discussion developed the fact that interest in formation of state chapters was widespread.

The session was called to order by Albert Burch, president of the California Metal Producers' Association, acting as temporary chairman. G. M. Swindell, secretary of the Los Angeles Chamber of Mines and Oil, acted as temporary secretary.

The principal speaker of the morning session was James F. Callbreath, secretary of the American Mining Congress, to whom is due the present success of the organization as a potent factor in the great constructive mining program now before Congress at Washington. Mr. Callbreath strongly urged the formation of state chapters to aid in the future program of the American Mining Congress. This program, as outlined, is more far-reaching and ambitious than anything yet undertaken, and includes a segregation of the mineral industry into eight divisions, such as copper, gold, silver, the non-metallics, oil, and three others, each to be represented in the American Mining Congress, in Washington, by a man who is an authority in that particular branch of the industry which he represents.

Objectives of the Mining Congress

The main objects of the Mining Congress may be briefly stated as follows: To bring about Federal cooperation through research and investigation; to protect mining investors against fraud and misrepresentation; to promote safety and efficiency in mining operations; to secure uniformity in state laws governing mining operations under like conditions, and, especially at the present time, to aid in passing legislation for the relief of chrome, manganese, and pyrites producers.

For the financing of the activities of the Mining Congress, a system was prepared, similar to that adopted by the Arizona chapter on Jan. 13. This provides for a voluntary yearly tax of 10c. per $1000 of production, with a minimum fee of $60, and a maximum of $6000. This method seemed to meet the approval of the local gathering.

At luncheon, J. K. Lynch, governor of the Federal Reserve Bank, spoke on the "Relation of Mining to the Banking and Financial Interests of the Country."

At the afternoon session, a committee on organization consisting of George W. Starr, managing director of the Empire mine, Grass Valley; George W. Metcalfe, manager of the Mammoth Copper Co., Kennett; Murray Innes, quicksilver operator, San Francisco; Thomas A. O'Donnell, oil operator, Los Angeles; and G. M. Swindell, secretary of the Chamber of Mines and Oil, Los Angeles, was appointed to frame bylaws. A committee on membership, Edwin Higgins, chairman, and one on resolutions, J. H. Mackenzie, chairman, were also appointed.

The first day's proceedings closed with an address by H. Foster Bain, assistant to the director of the U. S. Bureau of Mines, his subject being "The American Mining Congress and the Bureau of Mines." At dinner, addresses were made by T. A. O'Donnell, on the "Accomplishment of the Oil Industry Toward National Welfare During the War Period," and by T. A. Rickard on the "Effect of Publicity Upon Mining."

On the morning of Jan. 16, Bulkeley Wells, the president of American Mining Congress, further outlined the work and scope of the congress. D. M. Folsom, former Federal oil director for the Pacific Coast, spoke on "Ore and Oil Land in Times of Peace." At luncheon, Judge John F. Davis pointed out the great need for a Secretary of Mines as a member of the Cabinet, and Frank B. Anderson, president of the Bank of California, addressed the meeting on "The Attitude of Bankers Toward Mining Investments."

At the afternoon session, organization of the California State Chapter was completed, and the following directors were elected: For one year, Andrew Carrigan, L. D. Gordon, M. H. Whittier, K. Kingsbury and Clifford G. Dennis; for two years, Albert Burch, George Metcalfe, W. J. Loring, E. J. Doheny and John Barneson; for three years, F. W. Bradley, T. A. Rickard, J. H. Mackenzie, L. P. St. Clair and M. H. Gallagher. The meeting was then adjourned.

The Future of Mexican Mining

FROM AN OCCASIONAL CORRESPONDENT

YOUR request for information respecting conditions as they affect mining in the districts with which I am familiar reached me while traveling in Mexico, but was not answered until I returned to the States. You know that the censorship on the American side is still in force in respect both to letters entering and coming out of Mexico. You also know that there are many employees of the Mexican government and of various revolutionary heads on our side of the line, and consequently there is always the possibility of casual remarks being translated and returned to headquarters, where they are not always read in the spirit in which they are written. Suggestions made for the benefit of Mexico at large are not always relished by the present government nor by revolutionary heads, and their authors may be treated most unpleasantly.

"Mexico for the Mexicans" is an expression that we frequently hear these days, meaning, literally, "there is no room here for foreigners"; and if we could get out with whole skins, or with a reasonable portion of the funds that we brought into Mexico to develop the mines, many of us would be glad to go, in spite of the fact that we were not only invited but urged to come and help her open her mineral and oil deposits.

MEXICO DEPENDENT UPON FOREIGNERS

But what would Mexico be without foreigners? Does she really need them or does she not? Does she need their initiative, energy and money?

One of the chief sources of national and state income is that derived directly or indirectly from the operation of her mineral deposits. Ownership is taxed, production is taxed, transportation is taxed, and imports consumed by the miners and laborers are taxed; indeed, were it not for these various taxes Mexico would be in sore straits for income and the wherewithal to maintain her government. Her agricultural possibilities are much overrated. True, she can raise cattle, cotton, corn, fruits, sugar cane and some other commodities, but large areas are so dry and forbidding that they can maintain but a sparse population. The country is not self-supporting. Along the coast line agriculture is of importance, but the area concerned is insignificant compared with the great stretches of table land of which only small sections have been brought under irrigation. There are extensive areas of this that might be irrigated, but the operation would require large expenditure of money. The individual farmer or rancher cannot do it. It is government business, and yet the government has no means of launching such projects.

Mexico needs this agricultural land, but she can only realize its possibilities through the use of foreign capital, and this cannot be secured unless a reasonable guarantee is given for the security of capital and interest. Today her mines are worked only half-heartedly, and she fails to see that lighter taxation would not only stimulate production in the operating mines but would result in the reopening of many closed properties. This would result in a net tax greatly exceeding that which she is now able to levy and collect.

It is not necessary to criticise the present government. The caliber of the men that constitute it is realized. Their idea seems to be to levy a tribute as great as the traffic will bear; and they constitute themselves the judges of this. The old Cientifico group understood better the principles of economy. They were satisfied with a reasonable tribute, and the country prospered under them. Whatever may be the desire of the better element within or outside of the government circles, it is powerless, because of the much greater number of incompetents who would not hesitate to again overturn the government if too great pressure were brought to bear in an attempt to curb their actions.

During the revolution, which goes merrily on, the loss of foreign-owned property has been great. Claims have been presented, but no serious efforts have been made to adjudicate the losses or to reimburse the losers. The claims of foreigners are still pending, and, so far as we are informed, no government has taken any steps to back up its nationals in securing redress.

LOSSES INCURRED BY MEXICANS

The losses among the better class of Mexicans have been heavy. The large *haciendas* have been stripped of their livestock and agricultural implements, and then their owners have been told to pay their taxes. Robbed of money, livestock, and tools, it is not an easy matter to set things going again, let alone pay heavy taxes.

The destruction of railway property—bridges, track, engines, and cars—has been enormous. The whole country is suffering for lack of rolling stock, and business on several lines is practically at a standstill for the want of it. A large portion of Mexican freight is now handled by private companies using their own cars and locomotives with the aid of the Mexican railway employees and under the direction of the Mexican railway officials. Among those operating in this way are the American Smelting and Refining Co., American Metal Co., International Ore Co., Mazapil Copper Co., Teziutlan Copper Co., Monterey Mining, Smelting and Refining Co., Guillermo Colignon, and Republican Mining and Metal Co. No interest has been paid to the bondholders of the railways for five years, notwithstanding the fact that a tax was collected for this purpose.

One thing that is extremely aggravating and that militates against further resumption of business is the frequent issuing of decrees, which order one thing today and something else tomorrow, so that no one knows where he stands or what he can depend upon. It is generally supposed in the States that there is a Mexican Congress that is responsible for the laws. There is a Congress, but such laws as we are now trying to obey come by decree from Carranza.

It is strange that Carranza and his associates should have such a hatred for Americans, for he occupies his present position because of the action of our Executive in respect to Mexican affairs a few years ago, and every official move on the part of the United States has been of a friendly nature.

One of the petty annoyances that we suffer is that respecting passports at the Mexican border. As a war necessity the United States Government required every-

one leaving the States to obtain a permit from Washington. When this order was issued the Mexican Secretary of Foreign Affairs issued instructions to the effect that no one be allowed to enter Mexico without his passport first being viséd by a Mexican Consul, and this may be done only on written permission from the Mexican government. The necessary correspondence requires about 20 days. The visé is good for only one occasion. This is exceedingly vexatious to those who are doing business in the two countries and are frequently making trips to and fro. There are, of course, ways of cutting red tape, but they are not creditable to us nor to the Mexican officials. We are informed that all this is in retaliation because our Government required residents to account for their migrations during war time.

Another inconvenience to which travelers are subjected is that of fumigation at the border. When typhus was raging throughout Mexico about two years ago there was good reason for fumigating all baggage coming into Texas from the south. This necessity certainly does not now exist. Here, again, Mexico retaliated, but in practice the operation seldom goes beyond the necessity of paying the fumigation fee, after which the baggage passes on as clean.

Some one has said that "peace still rages in Mexico." Villa is at his old stand in Chihuahua and Durango; Zapata in Morelos; Palaez and Cedillo in Tamaulipas. Aguilar is in Vera Cruz dynamiting trains from time to time as they pass to or from Mexico City. Eulalio Gutierrez, one-time president of Mexico, is in San Luis Potosi and Zacatecas, and Chevez Garcia is in Jalisco. These are the names we hear quoted in the north as bandits of no mean type, but it is doubtful if they are doing any more toward destruction of Mexico than the recognized government. Indeed, it is a common experience to hear of more severe treatment at the hands of the present military officials than at the hands of the so-called bandits, many of whom were at one time loyal Carrancistas. To a foreigner there appear to be two types of bandits—those who are in power, and those who would like to be there, but, lacking that advantage, must make a living anyway.

We long for the time when our Government may give some attention to this distracted country and may lend a hand to save the Mexicans from themselves.

Chemical Alliance Extends Its Scope

At the second annual meeting of the Chemical Alliance, held at the Biltmore Hotel, New York, on Jan. 23, the question of the continuance of the organization was discussed and voted upon. The president, Horace Bowker, outlined the history of the Alliance, particularly with reference to the assistance given to the Government during the war, recalling the fact that it superseded and absorbed the Advisory Committee on Chemicals of the Council of National Defense. Its function, as defined in strict accordance with the conditions prevailing at that time, was that of a war agency, and the question arises as to whether the signing of the armistice and the imminence of actual peace should indicate the desirability of its dissolution, either now or in the near future.

Although obviously created for war purposes, the need of such an organization, as representative of the entire chemical industry, will be, during the reconstruction period, as great as or greater than it has been in the past. Studied consideration must be given to three important problems which face the industry at the present time. The first of these is in connection with the urgent need for the validation of war contracts, involving vast expenditures on the part of the industry, which were not executed, in the stress of wartime haste, with due regard to all the necessary legal formalities. In many cases such a procedure was impracticable. In others it would have entailed an unjustifiable delay.

In the face of existing legislation the Government cannot pay any debts incurred under such circumstances, although the moral obligation in the matter is unquestioned. Legislation must therefore be enacted to remedy the existing status. The matter is well in hand, and adequate protective action is already under consideration.

The second question which demands consideration refers to the resale of material bought by the Government under war contracts and to be resold as soon as practicable. Some business dislocation has already been caused by inconsiderate action in this connection, and the best means of avoiding further trouble is occupying the attention of the Alliance. The third question of importance refers to the possibility of expanding foreign trade in chemical products.

It was announced that the board of directors had decided to support any scheme for the continuance of the organization in its present form. The proposition was put to a vote at the general meeting, and there was unanimous concurrence. The special committee which has been appointed to study the question of foreign trade is now to act under the ægis of the Alliance, and expects to report its findings within two months.

Foreign Trade in Copper

Exports of copper from the United States in November, 1918, and for the first 11 months of the year, are reported by the Department of Commerce as follows:

	Nov., Lb.	Jan.-Nov. Lb.
Ore and concentrates metal contents	51,500	3,249,839
Unrefined, in bars, pigs, etc	110	14,015,823
Refined, bars, etc	44,582,955	645,328,960
Old and scrap	22,400	257,403
Pipes and tubes	581,992	3,948,437
Plates and sheets	168,530	14,711,152
Wire, except insulated	965,295	14,353,361
Composition metal, copper chief value	20,064	153,680

The weight of ore exported in November was 130 long tons; and of concentrates, matte and regulus, 105 long tons.

Imports of copper into the United States in November and for the first 11 months of 1918 are reported by the Department of Commerce as follows:

	Nov., Lb.	Jan.-Nov., Lb.
Ore and concentrates, contents	8,420,871	114,095,936
Matte and regulus, etc	6,978,944	32,924,523
Unrefined, in bars, pigs, etc	27,793,791	351,965,947
Refined, in bars, etc	3,132,388	35,400,209
Old, etc., for manufacture	299,641	1,273,882
Composition metal, copper chief value	.....	207,675

Material imported in November was 18,256 long tons ore, 12,729 long tons concentrates and 5451 long tons matte and regulus.

Assayer and Chemist

Determining Dissolved Oxygen in Water*

BY ISAAC S. GUEST

The determination for dissolved oxygen is not usually made in the examination of water, but in the making up of standard solutions for oxidizing purposes the oxygen content of the water used should be known. The latter is only necessary in the most accurate work. The solutions used are: potassium permanganate, 4 gm. per liter; potassium oxalate, saturated solution; sulphuric acid, 1 to 5 or 6; manganous sulphate, 350 gm. per liter; alkaline potassium iodide, 400 gm. KOH, 150 gm. KI to make a liter of solution; N/40 sodium thiosulphate solution.

The sample is collected in a 100- or 200-cc. bottle the volume of which is known. Care must be taken that all the air originally in the bottle is completely removed before stoppering the bottle. If the sample is collected from a pond, or like source, it should be sunk beneath the surface, or if from a tap, a hose should be run to the bottom of the bottle and the water allowed to flow for at least 5 min. One cc. each of permanganate and acid should then be added, using a long narrow tube, releasing it at the bottom of the bottle. The stopper is replaced, the bottle well shaken and allowed to stand for 20 min. provided the color persists that long; if not, more permanganate is added. At the end of that time enough oxalate to decolorize it on standing a short time is added. The purpose of the process is to destroy any nitrite which may be present.

Two cc. each of manganous sulphate and alkaline iodide are then added in the same manner, and the bottle is stoppered and shaken and set aside for the precipitate to settle. Enough acid, about 3 cc., to dissolve the precipitate is then added. The solution is then poured into an Erlenmeyer flask and titrated at once, using the standard thiosulphate solution, with a starch indicator N/40 thiosulphate is equal to 0.0002 gm. of oxygen per cc., so the oxygen content of the bottle is 200 N/V, N being the number of cc. used to titrate, and V the volume of the bottle. The percentage of saturation is 20000N/VO, O being the solubility of oxygen in water at the particular temperature at which the sample was collected.

As the sample rapidly assumes the temperature of the air, the manganous and manganic hydrate should be precipitated as soon after collection as possible. After precipitation, it may stand some time without harm. After the liberation of the iodine, it should be titrated immediately, as standing in light decreases the iodine content and standing in the dark increases it.

To determine the oxygen content of the reagents, a blank may be run, using oxygen-free water. This is prepared by precipitating manganous hydrate in a large bottle of water and allowing it to stand. The manganous hydrate gradually is oxidized to a mixture of the -ous and -ic hydrates. The sample should be taken from the bottom, using a bulb and a tube extending to the bottom of the bottle. This blank is seldom necessary, as the amounts used of the reagents are small and the oxygen in them is generally low.

*Abstracted from *Chemist-Analyst.*

Time Limits for Analyses

Years of actual experience in the metallurgical laboratory have shown the following time limits to be practicable for rapid determinations without impairing the accuracy of the results obtained, says A. F. Macfarland in *Iron Age.* One man performs the analysis, and his time is counted from the moment he receives the drilled sample to the time the written report is ready: Carbon, 10 to 13 min.; carbon and manganese, 12 to 14 min.; carbon, manganese and nickel, 14 to 18 min.; carbon, manganese, nickel and chromium, 22 to 28 min.; carbon, manganese and sulphur, 15 to 19 min.; carbon, manganese, sulphur and phosphorus (estimated), 18 to 24 min.; carbon, manganese, sulphur, phosphorus, nickel and chromium, 35 to 40 min. If other than preliminary tests are analyzed in the laboratory, as is usually the case with small steel plants, the chemist should be notified 10 or 15 min. before the preliminary sample is furnished, to enable him to make the requisite preparations.

Minor Economies in Assaying*

BY T. GRAHAM MARTYN

A little economy that I effected about six years ago may be worth recording. By keeping an extra muffle door in use I do all the parting without any cost for heat either with primus or other burner or electric heater. A muffle door showing a good red heat over, say, half its inner surface is replaced by the spare one and carried into the parting room, laid, cooler side down, on a suitable non-conducting support, and propped up, if necessary, so that the hot side or top is level. A frying pan, preferably of aluminum, is placed on it; and the porcelain crucibles, as soon as the 1 to 2 nitric acid is poured into them, are placed one after the other in the form of a spiral, beginning on the margin and proceeding in clockwise direction toward the centre. A few moments' pause after the crucibles are filled and *in situ* suffices for heating the acid, and beads are flattened and transferred to them.

When the brick is too hot and the action becomes violent, the frying pan is lifted for a moment and three little pieces of asbestos board are placed on the brick to keep the frying pan from contact with the hot surface. The handle of the frying pan should be cut to a

*Abstracted from the *Journal* of the Chem. Met. and Min. Soc. of South Africa.

length of about five inches, with asbestos cord wound round it and made secure, so that it can be easily handled. When the acid treatment is considered sufficient, distilled water is added, preferably by siphoning over from a Winchester quart bottle placed on an adjacent shelf. The slightly cooled and diluted acid is poured off, the empty crucibles being placed, in turn, on the working bench, preferably on a square of asbestos board in the same spiral fashion. Wash water is run on and again poured off, and the empty crucibles are replaced on the frying pan, covered with a large filter paper, left about five minutes to dry, and then transferred to an annealing tray and annealed in a suitable muffle, preferably one reserved for this work, and having the slit at the back closed, to avoid drawing dust-laden air over the crucibles.

Titration of Copper With Cyanide*

BY M. P. APPLEBEY AND K. W. LANE

The titration of ammoniacal Cu solutions with KCN ceases to give a sharp end point when the concentration of Cu is much less than 1 gm. per liter. Solutions of the alkali Cu carbonates in excess of Na_2CO_3 can be titrated directly with KCN with fair accuracy, even at concentrations of 0.1 gm. Cu per liter. Add the solution containing the Cu to be estimated to a warm solution containing about 70 gm. of anhydrous Na_2CO_3 and 50 gm. of $NaHCO_3$ in 500 c.c. Prepare a standard Cu solution by dissolving 0.1 gm. in dilute acid, and add slowly, with constant stirring, to 500 c.c. of the Na_2CO_3-$NaHCO_3$ solution; standardize the KCN solution against this solution as in the ordinary NH_4OH method. The double carbonate solutions are a deep Cu blue, quite unlike a Cu-NH_4 blue. On adding KCN, the color changes to a pale bluish purple, which on further addition of KCN changes to a grayish—the end point. The titration requires a good daylight and experience. The gray end tint is not permanent, the solution becoming clear and colorless after standing for a few minutes. It is, therefore, not possible to use one completed titration as a standard tint for subsequent titrations. The titer of the solutions depends to a small extent on the amount of $NaHCO_3$ used in making up the solutions so that it is necessary either to have approximate equal concentrations of $NaHCO_3$ in the two solutions which are being compared, or to make an allowance for any difference in $NaHCO_3$ concentration.

Determination of Lead in Copper†

In the spectroscopic determination of lead in copper, an electric arc that may be controlled and maintained under constant conditions is utilized to melt a carefully weighed sample of the copper to be tested. This sample is placed within a cavity in the positive electrode, which is made of graphite. The negative electrode is of carbon and is so suspended that it may be rotated.

A spectroscope is so adjusted that the observer may see the lead-line, within the molten copper, as a bright, distinct line. With a stop-watch, the time is determined between the melting of the copper sample and the disappearance of the lead-line from the spectrum. This time is proportional to the lead content of the sample, the exact determinations depending upon the apparatus employed.

The apparatus is first calibrated by means of various samples of lead in which the content is known from comparative electrolytic analysis of the samples, and by checking routine analysis. Also by using synthetic samples made by adding a carefully weighed amount of pure lead to the required amount of pure molten copper.

The chief advantages are accuracy, speed, and facility of operation. The analysis can be made in a few minutes by the foreman of the refining plant, or a boy of high-school intelligence, and the process can be followed rapidly without the necessity of holding back the furnace for a chemical analysis. Even the final analysis made just before pouring, which requires great accuracy, can be made in a few minutes and is of greater accuracy than that of the chemical method.

The disadvantage of the spectroscopic method for determining the percentage of lead present in copper is that the method can be used only where the lead is uniformly distributed throughout the sample.

*Excerpt from the *Analyst*, and *Chemical Abstracts*.

†Abstract of a paper by C. W. Hill and G. P. Luckley, in Bull. 123, A. I. M. E.

Determination of Molybdenum*

BY C. S. EPPERSON

Owing to the increased importance of molybdenum, and the scarcity of published data, the method to be described for the determination of molybdenum in wulfenite ores may be of use to metallurgists. My own experience has shown it to be suitable when extreme accuracy is not required.

Weigh out 0.5 gm. of the finely pulverized ore and digest with 10 c.c. of HCl, and, after evaporating almost to dryness, take to fumes with H_2SO_4. The assay at this point is diluted and allowed to stand at a temperature of 80° for 10 min., so as to permit all anhydrous ferrous sulphate to dissolve. It is then filtered and the precipitate run for lead if desired. The filtrate is made alkaline with NH_4OH and the iron filtered off. At this point the Mo is in the filtrate, which is acidified with acetic acid, heated to 80° C. and titrated with standard lead acetate solution.

It is convenient to have the lead acetate solution to read c.c. to c.c. of the ammonium molybdate solution. Five grams of c.p. lead foil is dissolved in nitric acid and taken to fume with H_2SO_4; the precipitate is then dissolved in $NH_4C_2H_3O_2$ and made strongly acid with acetic acid. Twenty-five cubic centimeters of the lead acetate is then titrated with the standard ammonium molybdate, in order to obtain the lead value of the acetate solution. The lead factor of the acetate solution multiplied by 0.4640 gives the Mo factor.

Impervious Concrete is now possible by the application of a liquid known as "Metalo," according to *Iron and Coal Trades Review*. The process, which is a secret one, accelerates the setting of the concrete and, in the case of reinforced concrete, it is said to produce greater adhesion between the metal and the concrete. The accelerated speed of setting and the greater density materially diminish the tendency to crack, and not the least important consideration is that porosity is entirely eliminated. It is claimed, further, that the application of "Metalo" to timber will harden it and render it waterproof and fireproof.

*Excerpt from *Chemist-Analyst*.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

New Potash Bill Drafted

Control of imports of potash by a licensing plan is provided in the draft of a bill now before Senator Henderson, the chairman of the Committee on Mines and Mining. The bill has the approval of the Secretary of the Interior and is intended to safeguard the interests of the domestic potash producers until trade conditions are readjusted. The text of the bill follows:

A bill to safeguard temporarily, by a license control of imports of potash, the interests of domestic potash producers, until trade conditions are readjusted.

Sec. 1. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that, inasmuch as it is important for the national welfare and security to provide for an adequate and permanent supply of potash, and for this purpose to encourage the domestic production, manufacture, and recovery of potash, the Secretary of the Interior is hereby authorized and empowered to issue licenses from time to time, to persons, firms, or corporations, for the importation of potash, and from and after 30 days after the approval of this act no potash shall be imported into the United States without such license. Each license shall state the amount of potash which the licensee shall be permitted to import and shall be issued only on condition that the applicant has purchased or contracted, under guarantee satisfactory to the Secretary of the Interior, to purchase an amount of potash produced in the United States bearing the same ratio to the amount which he is permitted to import as the estimated total production of potash in the United States bears to the difference between this estimated total production and the estimated total requirements of the United States. Estimates of the total requirements and of the total production in the United States shall be made under the direction of the Secretary of the Interior at intervals of not less than six months, and as so made shall be taken as conclusive: Provided, That potash once reckoned in any transaction shall not be reckoned again: Provided, further, That whenever the Secretary of the Interior shall find that potash is not being produced, or is not likely to be produced, in time or at a cost to make it economically available in the United States in sufficient quantities to meet the requirements as estimated by him, or whenever he shall find that the price thereof is not fair and reasonable, he may issue licenses for the importation of potash in excess of the proportion fixed under this section.

Sec. 2. That there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $150,000, to be available until June 30, 1924, for every expenditure requisite for and incident to making the estimates provided for in this act and for conducting investigations relating to the production of potash, including personal services in the District of Columbia and in the field, the purchase of filing devices and other office furniture and equipment, the hire, maintenance, repair, and operation of motor-propelled and horse-drawn passenger-carrying vehicles for field use only, to be expended under the regulations from time to time prescribed by the Secretary of the Interior: Provided, That not to exceed $30,000 shall be expended for the above objects during the remainder of the fiscal year ending June 30, 1919, and not to exceed $30,000 during each succeeding fiscal year until June 30, 1924.

Sec. 3. That five years after the proclamation of peace this act shall cease to be effective, all powers conferred thereby shall end, and the Secretary of the Interior shall terminate all transactions under this act.

H. S. Gale, the potash specialist of the U. S. Geological Survey, speaks as follows concerning the bill:

The proposed bill to insure the sale of domestic potash seems to be the most satisfactory solution of the problem that can be found. By allocating imported potash in the same proportion as domestic potash, the consumers' cost is not raised to the price paid for the domestic product, but is much lower. Under present conditions, for example, when the quantity of domestic production is one-fourth of that which may be assumed would be normally consumed, one part of domestic potash will be combined with three parts of imported potash, to be sold at the average price of the whole. Thus it affords an automatic method of safeguarding the domestic producer, insuring a market for domestic material at a price to be fixed by competition among domestic producers alone. The slight increase of the average price of potash to the consumer will not be a serious burden, and will at most be temporary.

Much of the uncertainty with regard to potash importations from Alsace was removed Jan. 24, when the War Trade Board announced that no Alsatian potash would be available before June. Domestic producers of potash have been insisting that an official statement be made which would clear up this uncertainty entirely. The Secretary of the Interior, it is understood, also will be requested to issue a formal statement with regard to the Alsatian potash situation. The official statement of the War Trade Board reads as follows:

France will be unable, at least until April, to ship potash from the potash mines of Alsace. The War Trade Board announced today that it has received authentic and official information to that effect from the French High Commission in the United States. These advices further indicate that for the next few months practically the entire potash output of the Alsatian mines will be urgently required for agricultural purposes in France.

It is the view of the War Trade Board, based upon this information, that, even under the most favorable circumstances, no potash from Alsace could be available in the United States for agricultural uses before June, 1919, and that, therefore, it will be necessary that the United States rely entirely upon its domestic potash production for the coming spring season.

Excess Labor Supply in Arizona

Every effort is being made by the Department of Labor to advertise the fact that a surplus of labor exists in Arizona. This is attributed to the curtailment in the production of copper. One of the department's announcements reads as follows:

The Federal Director of the U. S. Employment Service for the State of Arizona and the Arizona Labor Director have both wired the Federal Service urging that all discharged soldiers and sailors not formerly residents of that state be diverted from seeking employment there. Arizona is accumulating a large surplus of labor, and, owing to a heavy curtailment in the production of copper, opportunities for employment are rapidly decreasing.

For some time copper producers in Arizona have not been able to market the copper produced, with the result that there is now an immense unsold stock. On account of this condition, both smelteries and mines are shutting down, and thousands of men are being laid off. Up to the present about 30% of the normal number employed has been laid off.

The state purposes taking care of and providing employment for all returning soldiers and sailors who went from Arizona, but cannot take care of the thousands that are pouring in from other states, attracted by the reports that wages are unusually high in Arizona. Many of these men arrive practically without funds, only to find that there is little or no prospect of securing employment of any kind.

The Senate has passed a resolution by Senator Henderson making sure that the relief from assessment work on mining claims will extend to Alaska. Section 2324 of the Revised Statutes, which refers to annual assessments, dates from 1872. Annual assessment in Alaska, however, is covered by Section 5051 of the Revised Statutes, which dates from 1907. It was feared that the amendment to the former statute might not apply to Alaska, and Senator Henderson's resolution removes any possibility of misunderstanding.

Butte & Superior Profits

In opposing Minerals Separation's request for a Supreme Court injunction restraining Butte & Superior "from disposing of its assets pending action on the mandate of this (Supreme) Court," the last-named concern, after asserting its solvency and ability to meet any judgment, made the following statement:

The alleged profits of $18,000,000 (named by Minerals Separation in its petition for restraining order) are all the profits . . . made in the conduct of both its mining and milling operations (including concentration) for the 12 years it has been engaged in the business of mining and milling ores. The statement in the petition regarding profits due to the alleged infringement (of Minerals Separation patents) are all based on mere speculation and conjecture, without any supporting proof.

It should be understood that respondent is engaged not only in the business of concentrating ores, but is, at the same time, engaged in . . . mining and milling such ores before concentration—that is, taking the ores out of the ground, and grinding them so as to render them fit for concentration by non-infringing as well as alleged infringing processes.

Mining and milling operations are separate and distinct operations, and are frequently conducted by separate and distinct companies. The ore when taken out of the ground is more valuable than when in the ground, and a profit accrues from this operation. The ore after preliminary milling is more valuable than when taken out of the ground, and a profit also accrues from this operation. The preliminary wet concentration of the ground ore . . . makes the resultant product more valuable than the milled ore, and a profit accrues from this operation.

The alleged infringing operation . . . is the final concentration of the concentrates or tailings, . . . and the profit which accrues from this last operation is the only thing with which the petitioners are concerned.

Australian Mining in 1919

SYDNEY (N. S. W.) CORRESPONDENCE

Subject to metal prices and labor, some forecasts of Australian metal outputs in 1919 may be attempted.

Gold production will hardly be as much as in 1918, barring new finds, because the conditions which depressed production during the last three years will still obtain. The 1918 output may be put roundly at under 1,250,000 oz. Judging by the decreases since 1915, an estimate of just over 1,000,000 oz. for 1919 seems optimistic. It may be remarked that in West Australia fully 90% of the output is produced by about 12 mines, the remaining 10% coming from approximately 400 small mines.

Tin output may reach 3000 tons, but this seems doubtful, because the price is so much lower than in 1917-18. Even with the record prices, it may be recollected, the output showed little increases over that of 1916. An estimate of 2000 tons may be rather under the mark. Since the "control" has been lifted there is no difficulty about the disposal of the metal, which is on the priority list for shipping space.

It was recently announced that the sale of lead had been "arranged" for up to Mar. 31. The basis price in Australia, offered by the only customs works in operation, is £27 15s.; and, after Feb. 16, this price will be £20 pending "adjustments." The price arranged for is, of course, much below the London quotation, which is about £40. Under the conditions of price and scarcity of shipping space, it does not seem probable that the usual output of 160,000 tons per annum will be exceeded in 1919.

For all producing copper mines the Imperial contract ended on Nov. 1, 1918. It takes 60 days to refine their blister, and the present contract ended on Dec. 31, 1918. The two refining works, Wallaroo and Port Kembla, pay £80 as an advance pending realization in 1919. This does not cover costs except for Mount Lyell and Wallaroo. There seems, however, a good prospect of getting an extension of the contract to June 30, 1919. Under above conditions it does not seem likely that the usual output of 40,000 tons per annum will be attained in 1919.

It is plain that the extension of contracts with the Imperial government for the whole output cannot continue, and a return to pre-war conditions is inevitable, with the exception that the whole output will now be handled by one body—the Copper Producers' Association. The trial and test of the commercial efficiency of these Australian metal associations is now beginning. They will no longer be able to sell the whole output to one buyer, but will have to cater to the many smaller consumers. That is to say, they will have to trade on the London Metal Exchange.

These attempts to forecast conditions are overshadowed by the shipping scarcity, for accumulations of produce already sold to the Imperial government will take priority on any other produce during 1919.

Chilean Nitrate Movements

Shipments from Chile to the United States were still on a considerable scale in the first half of December last, namely, 97,000 tons, only 3030 tons to Europe, and 2800 tons to "other parts," according to the *Chemical Trade Journal and Chemical Engineer*. Although the monthly rates stipulated in the contract for 680,000 tons entered into between the nitrate of soda executive and the Chilean government have not been adhered to, the whole quantity has now been delivered, and it will be interesting to see how much nitrate will be exported during the next few months. British firms are not yet allowed to make independent purchases on the West Coast, and the big German houses in Valparaiso formerly transacting the bulk of the business are on the "black list," and consequently not doing business. In the meantime, the Allied governments, acting through their purchasing agents—themselves nitrate producers and exporters—are reselling in different quarters the large quantities no longer required for the manufacture of explosives. The legitimate trade is thus brought to a standstill until such liquidation is completed, and the nitrate producers who hold large unsold stocks are placed in an awkward position; it is the more tantalizing in that the depreciation of the Chilean currency has materially reduced the cost of production, as also the export duty equivalent, thus enabling the acceptance of lower prices if there were a free market. The Santiago Co. has announced the shutting down of its works.

Employment for Engineers

For the convenience of engineers returning from military service, a list of agencies is here given which may be helpful to those who are seeking employment:

Engineering Societies Employment Bureau: Walter V. Brown, secretary, 29 West 39th St., New York City.

Division of Engineering, United States Employment Service: A. H. Krom, director, 29 South La Salle St., Chicago, Ill.

Professional and Special Section, United States Employment Service: George W. Kirchwey, state director, 16 East 42d St., New York City.

27th Forms Permanent Organization

Our latest direct news from the 27th Engineers is through letters dated Dec. 30, 1919, but we hear from Washington that they have not yet embarked for home, although they are scheduled for early convoy.

Colonel Perry wrote that the $2500 for the boys' Christmas party, that we sent over from the Comfort Fund, arrived in due time, and Colonel Perry making a generous addition of his own, the boys had "some Christmas." Colonel Perry continued:

As soon as the donation was received it was distributed to the several companies with instructions to the officers to get busy and rustle up the stuff for a real Christmas. Trucks were sent out to scour the countryside for pigs and poultry, and other trucks were sent to the market at Bar le Duc for various Christmas plunder, including cigars.

The dinner was a great success. The boys all enjoyed themselves hugely and were more than grateful for the generous contributions of their friends in the United States, who made such an affair possible. There has been something of a shortage of rations lately, particularly in the line of fresh meats and fresh vegetables, most of which are being shipped to the 3rd Army in Germany, and this fact made the fresh stuff, which we were able to buy for the men, all the more welcome.

While the dinner was in progress yesterday, Captain Norcross and myself made the rounds and took a vote of the men on the idea of making the Association of the 27th Engineers a permanent organization, with the men of the regiment and the men who have contributed so generously to its Comfort Fund as members. The membership fee is to be $1 a year, to pay for postage and keeping in touch with the men of the command. The idea is to have an annual dinner at some place or places to be decided upon later, when we can get officers and men together and talk things over. A motion to make the organization a permanent one was carried through with a whoop. W. R. Ingalls, of New York, was elected permanent president.

We all feel we have been most lucky as representing an industry that has been so generous to its representatives. We also feel that we have been more than fortunate, since we could not do any mining, to be put at work which the men could do and do well.

I want to say for the men that they are worthy of all the efforts that have been made in their behalf. No man could possibly have a better bunch of loyal, enthusiastic, and willing soldiers under him than I have had. We were all disappointed at the outset in not having any mining work to do, but that was soon forgotten when the bridge work once got under way. The men were at all times ready to fight on the drop of the hat, and never allowed discouraging features, like shelling or Boche aëroplane bombs, to interfere with their work. I wish they could have had a chance to go over the top with the infantry a few times; but this, of course, was not possible.

All who have not contributed to the Comfort Fund are urged to do so. No greater satisfaction can be obtained for the same amount of money.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$19,653.56
W. E. Defty	10.00
Alaska Mining and Engineering Society	111.00
W. H. Corbould	6.50
Dover Laboratory	2.00
Interest to Jan. 1, 1919	105.30
L. W. Strauss	10.00
Total	$19,898.36

Checks should be made payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Aëro Station Service

Major-General Squier told the American Institute of Electrical Engineers at a recent meeting of that body that under the effective direction of Major W. R. Blair, one of the most experienced aërologists of the United States, commissioned for the service from the Weather Bureau, about 20 upper-air stations were established in France and England, and a forecast based on data furnished by these stations was made regularly to the A. E. F. The use which such forecasts may serve, both in connection with the aviation mail service and ultimately with the transatlantic service, may be seen from the fact that above the level of 10,000 ft. 95% of the winds in both the United States and Europe are from west to east.

On Nov. 6, 1918, at Chattanooga, Tenn., a velocity of 154 miles an hour at an altitude of 28,000 ft. was observed. It is because of this westerly direction of these upper air currents that all of the long flights thus far made have been from west to east. The importance of a forecast of such currents for the purposes of long flights will be appreciated as soon as the foregoing facts are understood. An airplane capable of a velocity of 154 miles an hour in still air either would remain stationary or travel at 308 miles an hour, depending on whether it was headed into or with a wind of the velocity of that observed at Chattanooga.

Extensive War Plant To Be Sold

Ten million dollars' worth of equipment owned by the U. S. Spruce Production Corporation, with headquarters in Portland, Ore., is to be sold; and sealed bids will be received by the Sales Board in the Yeon Building, in that city, up to and including February 15.

The equipment, which consisted of everything from picks and shovels to complete railroads and mills, is in excellent condition, and much of it was never used, because of the abrupt ending of the war. It is believed that this is an opportune time for the sale, as the country is facing reconstruction and adjustment and many large projects will undoubtedly be instituted soon.

The equipment has been stored at Vancouver, Wash., where it may be inspected by interested persons, upon proper certification by the Sales Board in the Yeon Building at Portland, Oregon.

To Confer on Labor Situation

In view of the curtailment of the copper output which followed the signing of the armistice, and the consequent reduction of working forces, the Secretary of Labor invited the grievance committees of employees of all the copper companies operating in Arizona, and representatives of labor in Utah and Montana, to send delegates to Washington to confer with him on January 31.

"On account of the grave conditions confronting the copper industry," says the Secretary's telegram, "it is the desire of the Department of Labor to coöperate in securing the best possible working conditions during the readjustment period. Therefore you are respectfully requested to join with other grievance committees in the ——— district which may be selected in the same manner as you elect members of your own grievance committee; these delegates, with similar delegates from other districts in the state, to report at the Department of Labor in Washington, D. C., on the morning of Friday, Jan. 31, for the purpose of general conference with the Department of Labor."

The mining and metallurgical district of Russian Poland, occupied by the Germans since 1914, has been evacuated and is now in the hands of the Polish authorities. This releases the collieries and the zinc and iron works of Dombrowa, Sosnowice, and adjacent places.

Editorials

Progress of the Readjustment

WE DO not think that the readjustment of business in this country has progressed so far as two months ago there was reason to suppose it would have by this time. Indeed, we doubt if it has really begun in any broad way. Our reason for this opinion is the persistence of ideas, that we behold on all hands, that economic evils can and ought to be maintained. So long as such ideas prevail, real readjustment will be delayed. As it is, we have got to pay a big penalty for the economic crimes of the last two years. We cannot continue criminal policies and expect to thrive.

Granted, a very difficult situation has been produced. The industries were not free to regulate their own affairs, and their direction was taken over by inexperienced doctrinaires. What was deemed to be nonessential consumption was arbitrarily cut out, while junior officers, without any thoughtful estimates of military consumption, bought recklessly of goods produced by labor at a fantastic wage scale. The disclosures after the armistice showed the Government to be overbought in everything to a degree that was all but incredible. Even under normal conditions the absorption of such enormous stocks would be a matter of a long time.

Then the labor leaders assume the attitude that wages must be maintained on the war scale, for they say the cost of living is as high as it was. Some producers say that they will not reduce their prices from the war scale, or not materially, for their cost of production is so high that there is no profit even at present prices. Every economist knows that there are temporarily market conditions when cost of production has nothing to do with the price. We see such conditions prevailing in some markets right now.

In general, the argument that wages cannot come down owing to their not having risen as high as the cost of living is a fallacy. The best evidence is that average wages rose in about the same ratio as the average wholesale prices of commodities, but that the average cost of living did not rise so much. There is a slack between wages and cost of living that can be taken up, and of course will be.

The great trouble in speaking of this problem in terms of averages is the range between the extremes. Some big classes of labor have profited at the expense of other classes of labor, and the situation of some of the latter is now very serious. The labor leaders have not thought sufficiently about this, viz., that when they were getting more wages for one group—the steam railway men, for example—they were taking it out of another group, say the trolley-car men, but that is just what they were doing. Readjustment of this, which is going to be necessary, is not going to be easy.

The idea of merely tiding over a difficult period in industry, after which prices and wages would naturally be the same as they were in 1918, wherefore keep them there in the interval, is grotesque. Consumers cannot be taken by the scruff of the neck and compelled to buy on terms that the Government would pay when it was a matter of life or death. The only way they can be led to buy is to offer them attractive terms. Not getting them, they will not buy at all, and producers, being unable to sell their product, will have to cease producing. The men will have their old scale of wages, but the pay window will be closed.

Already is idleness spreading over the country in a way that is alarming the authorities. They are imploring the people to buy goods to keep the mines and mills going. The people are in the main the wage-earners themselves. They cannot buy goods in sufficient quantity at war prices. The only way of stimulating consumption is by offering lower prices, and first the prices will have to be lower than economic conditions of the period would indicate. But then once more is there the everlasting spiral of rate of wages and cost of living. Profits no longer enter into consideration, for capital knows well enough that temporarily it has got to forego all profit.

We think we can foretell the day when real, broad-scale readjustment in this country will begin. It will be that day when it becomes certain that the wheat market is going to be set free, and set free it must be, no matter what the cost in keeping the Government's word to the farmers. Then will the cost of living begin to fall, then may lower wages be kindly accepted, then may attractive prices for commodities be made, and then will the wheels of industry begin to hum again.

Standardization of Mine Cars

IN THIS issue we present an excellent paper by Prof. R. M. Raymond on mine-car standardization which was read at the Seventh Annual Safety Congress of the National Safety Council. The views expressed in the article will make a valuable addition to the series on standardization by Charles A. Mitke which was recently completed in the *Journal*. There are so many factors that contribute to the success or failure of an underground haulage system, from an economic as well as from a safety point of view, that it would be well if Professor Raymond's article be regarded as but one fundamental idea of several considerations that are necessary in underground transportation. Sufficient clearing space, proper maintenance of track and grades, and efficient arrangement of block signals are all subjects that warrant further discussion in this connection, and that form a considerable part of mine operation.

It not infrequently happens that a well-planned mine, particularly if it be one of comparatively short period of existence, will offer conditions at the latter part of its life which will differ to a great extent from those determining the original scheme. This refers particu-

larly to flat-lying deposits, having a fairly uniform thickness and worked by one or another of the caving systems, where weight has a tendency to exert a lateral as well as a vertical pressure. The drifts, as originally planned, offered sufficient clearance and permitted ample room for transportation, removal of ore from chutes and contiguous operations. As the weight increased, the haulageways became smaller, and the problem of ore transportation required further planning. Such contingencies should be studied from the practical standpoint of dollars and cents, and not in a haphazard manner. Is it the more expedient for the mine manager to secure smaller equipment, which is more adaptable to the working space, or should he increase his opening area with the addition of more timber?

An analogous problem may arise concerning the track grades in the mine. A properly prepared, comparative cost sheet will often show that the mine management is using small equipment on heavy grades, whereas a slight expenditure would cut down the grade and permit the use of larger cars at a decreased cost in power account.

These suggestions are not in the nature of criticism, but are merely ideas inspired by a thoughtful reading of Professor Raymond's article. The paper, we believe, was written mainly for the propagation of the safety idea, but safety and efficiency go hand in hand, and the suggestion of a standardization of mine cars leads to the development of closely allied considerations in mine development and operation.

Technical Organization in Industry

THE saying that "peace hath her victories no less renowned than war" is as true as ever, but recent international happenings of great import were needed to bring home the fact that victory cannot be won in either instance without organized talent. Misdirected ability is less excusable than ignorance, because waste is unforgivable.

Events went well with Germany for many years. Early in 1917 the president of one of our greatest universities made the ominous remark, which was based on indisputable fact, that Germany was winning the war. In the light of more recent events the statement will bear a new analysis; and the lessons to be derived therefrom are of vital interest and significance.

Germany realized that her enemies were in earnest, and that they had men and materials in plenty. The morale of the armies of the Entente nations on the Western front, where the war would be won or lost, was and always had been excellent. French and British technicians were capable and even brilliant. Patent office records of the world's principal inventions during the past 100 years show that Germany is, comparatively speaking, low on the list. In resourcefulness both France and Great Britain, with their extensive colonies and overseas possessions, could justly claim a high place. Unlimited raw material was available for the Allied armies, whereas Germany was shut off from the rest of the world. On what controlling factor did the Central Empires rely to achieve their purpose? What lay behind the oft-repeated challenge as to the invincibility of Germany?

The passage of time enables one to view such happenings with due regard to their significance or insignificance in matters of great moment. Germany doubtless came to an early conclusion that, so long as she was opposed only by men and materials and valor and *esprit de corps*, her ultimate victory would be certain; for such qualities are no match against poison gas and other achievements of applied science. Great Britain's force of technical engineers, both in quality and quantity, was as great as or greater than her own, but security was felt in the fact that this talent would never be utilized, much less organized. Nothing could have given the German command greater confidence during the earlier stages of the war than the knowledge that British engineers—men skilled in mining, chemistry, and all the other vital branches of modern military engineering service—were offering themselves—nay, being urged by precept and advice—to squander their ability, experience, and worth as privates in infantry battalions. This fatal mistake did not lose the war for the Allies in Europe, but it took from them the credit of having ultimately won it unaided.

Germany's boasting lost none of its power or significance until it was realized that she was opposed by a nation where technical talent would be recognized and organized. She saw the writing on the wall when the fact was known that skill in engineering matters would be fully utilized in the United States, and that men of exceptional worth, in the same category as the chief of the chemical warfare service of the British Army, would not have to waste their time and talents, as he did, in the ranks, before they could rise to executive positions and so serve their country to the utmost of their ability. The impossibility of successfully opposing the organized technical talent of America was a potent factor in bringing home to Germany the knowledge that the end was near. The entry of the United States into the world war decided the conflict in favor of the Allies.

The lesson can be applied during the reconstruction period which is ahead of us. Real industrial progress is impossible without applied technical ability, and this must be fostered and encouraged. Our great technical and trade journals and engineering societies have done much. Our captains of industry must do more. Technical talent must be brought to light, and not allowed to hide itself under a bushel. For in peace time, as in war time, technology and scientific organization and management are the fundamental requirements for successful development. Recognition of circumstances and the realization of the facilities at command must come first. The utilization and organization of technical talent, to the utmost, must follow.

German Vandalism at French Mines

IN THIS issue, under the above caption, we publish photographs showing the destruction wrought by the Germans at some of the plants at French coal mines in the Valenciennes Basin. The story told by the photographs is a well-known one, and only bears out the statement that the ruthlessness of the Hun knew no bounds, whether it was destruction of industry, propperty, or lives. Little but a tangled mass of steel is left to mark a once-prosperous industrial center, a miscellany of ruin, unrecognizable for the most part.

The importance of the district, as a coal producer, will doubtless lead to a speedy reconstruction in that sec-

tion, for the large deposits still remain; but engineers will realize that it is no easy task that confronts the French operators. Not only will the reopening of the enterprise require a vast amount of construction work, but the underground rehabilitation will be an immense undertaking.

The *American Machinist* has made the interesting suggestion that the great stock of machine tools accumulated by the United States Government, for which now it has no need, be applied to the equipment of a national system of trade training schools in which the mechanical talent of America can be fostered and developed. This looks like a good idea and much better than throwing all this surplus equipment on the market.

We are amply on record as having opposed the price-fixing of copper from the time when it was first suggested in 1917. We said in the course of numerous commentaries that the price-fixers were moving without any sense of perspective or any idea of patience; and that the copper market could have been handled by men experienced in it, without any price-fixing, with safety to the industry and with better advantage to the Government itself. As facts are now becoming revealed, and anticipating those that are yet to come, we believe that the historian of a few years hence will write of the Government handling of copper as one of the colossal and egregious industrial blunders of the war, and one of the most troublesome in its after-effects.

BY THE WAY

The Rocky Mountain Club has been appointed the official representative of the State of Montana, to receive and welcome the returning Montana soldiers and sailors. Governor Stewart hopes to obtain an appropriation from the state to help carry out this work.

A soft blue-white diamond weighing 388¼ carats has been found at the Jagersfontein mine, Orange River Colony. This promises to become one of the diamond fields' historic gems. It is said to be the largest stone unearthed since the Cullinan diamond was discovered, in 1905. In the rough the latter weighed about 3000 carats. The Koh-i-noor weighs about 100 carats.

An amusing sidelight on the prosperity which the Cornish tin-mining industry is at present enjoying may be found in the fact that over 100 men on one well-known property received recently the first demand they have ever had for income tax, states the *South African Mining Review*. It was a new experience, which, naturally, most of them hardly relished.

Réaumur, the well-known French savant, is generally credited with the invention of the process of making malleable castings, which he described in a book published in Paris in 1722. However, a writer in a recent issue of *Stahl und Eisen*, says *Iron and Coal Trade Review*, states that Réaumur was anticipated by Prince Rupert, of the Royal Society of London, basing his claim on a statement printed in Dr. Joh. Joachim Becher's German book, entitled "Foolish Wisdom and Wise Folly," published at Frankfurt in 1682, according to which the prince had invented a process by which iron "could be made soft and ductile, so that it could be turned and used for making cannons of iron, which is not brittle but quite ductile, and, consequently, they are more suitable than those of ordinary gun-metal, their only drawback being that they were liable to rust." The writer quotes three patent specifications taken out in London by this prince, dated between Dec. 1, 1670, and the same day in 1671, relating to his process of softening cast or melted iron so that it may be filed and wrought as forged iron is. According to Becher the prince was carrying on his process in England on a large scale.

A dinner was recently given in New York complimentary to Col. William Boyce Thompson, in celebration of the successful work of the Home Paper Service, which was organized, with Colonel Thompson's aid, about a year ago, for the purpose of sending neighborhood newspapers to soldiers abroad. In the course of a speech upon this occasion, according to *Financial America*, Colonel Thompson said:

> Here we have had the advantage of free speech and free press Here we work under an agreement that the majority shall rule. We have schools and community houses and hospitals and playgrounds and have made some advancement in housing conditions and in improving the self-respect of the worker. But over there in those countries now torn by revolution, free speech and free debate were unknown. The public will could find expression only in revolution. These men and women cannot be led very well just now; they cannot be coerced at all. These men and women are from the soil. Over 80% of them have made and will continue to make their living from the soil. That sort of humanity usually does not go far wrong if let alone to work out its own salvation. We have highly important duties to perform toward that section of the world, and we should divest ourselves of any intention of participating in their politics or internal difficulties. Some headway in such a move might be made if those countries had our advantages of education. If they had been given a free and enlightened press, the work of preparation for the exercise of reasonable republican government would have been far advanced. But, over there they have got to build from the ground floor up. Without trying to control their inclinations in any way, surely we can offer to them sympathy and assistance. Above all, we can help them with our example.

Cap'n Dick had been watching the operation of an underground loading machine with much interest. "Dam-me," said he, "'er do 'andle tha h'ore, doesn't un? Reminds me o' tha story o' Mother 'Oney's duck, 'er do. Jan Trebilcock were boardin' to Mother 'Oney's 'ouse, an' one moornin' 'e come 'ome from night shif'. T'were'nt quite time for breakfus', so Jan 'e figgered as 'ow 'e'd be a bit 'andy. 'Mother,' sez 'e, 'can I 'elp thee a bit?' 'Coorse thee can, Jan,' sez she, ''Ere; take this 'ere corn do, an' gaw h'out an' feed chickens.' So, dam-me, h'out gaws 'e with tha pail an' all, an' starts thrawin' corn to tha chickens. All at once Jan 'e looks daown an' sees one o' these 'ere ducks with a bloody gert bill. Never befoor 'ad 'e seen one o' they, an' 'ere wuz tha creature gobblin' corn as fas' as ever 'e could. Jan 'e turns an' runs back to tha 'ouse. 'Mother', sez 'e, 'w'ere's tha butcher knife to?' 'W'ot's for thee want tha butcher knife, Jan?' sez she. 'Never thee min' naow, Mother.' So she gives 'im tha butcher knife, an' h'out 'e gaws, grabs h'up that there duck by tha neck an' slashes, firs' daown one side, then on t'other o' tha bloody beggar's bill. 'There naow, gos' along do,' sez Jan, 'Fight fair, m'son, fight fair—naw shovelling gaws.'"

The Mining Index

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10443—FLUORSPAR AND CRYOLITE in 1917. Ernest F. Budchard. (Mineral Resources of U. S., 1917—Part II; 12 pp., illus.)

10444—GRAPHITE—The Canadian Graphite Industry. Hugh S. Spence. (Summary Report, Mines Branch of the Can. Dept. of Mines, 1917; 2 pp.)

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10452—ENGLAND—Search for Petroleum in the Derbyshire Coalfield. T. Sington. (Iron and Coal Tr. Rev., Dec. 27, 1918; 1 p.) Conclusion of article previously indexed. 40c.

10453—ENGLAND AND WALES—Oil Deposits in England and Wales. (Iron and Coal Tr. Rev., Dec. 13, 1918; ½ p.) Conclusion of article previously indexed. 40c.

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10455—OIL SHALES—Oil-Yielding Shales in the Province of New Brunswick. Louis Simpson. (Bull. 1, Can. Min. Inst., Jan., 1919; 5 pp.)

10456—OKLAHOMA—Structure and Oil and Gas Resources of the Osage Reservation, Oklahoma. Wilson B. Emery, Dean E. Winchester, C. F. Bowen, and K. C. Heald. (Bulls. 686-B, 686-C, 686-D, 686-E and 686-G, U. S. Geol. Surv., 1918.)

10457—SCOTTISH MINERAL OIL INDUSTRY, The. (Journ. Soc. Chem. Ind., Dec. 31, 1918; 1¼ pp.)

10458—TEXAS—The Oil Fields of Northeastern Texas. W. L. Watts. (Min. and Oil Bull., Dec., 1918; 4½ pp., illus.) Conclusion of article previously indexed.

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10459—INDIA—General Report of the Geological Survey of India for the Year 1917. H. H. Hayden. (Rec., Geol. Surv. of India, May, 1918; 22 pp.)

10460—SOUTHWEST—Notes on Certain Ore Deposits of the Southwest. W. Tovote. (Bull. A. I. M. E., Oct., 1918; 13½ pp.)

10461—TESTS—Field Tests for the Common Metals in Minerals. Geo. R. Fansett. (Bull. 93, Univ. of Ariz., 1918-19; 21 pp.)

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FLOTATION

(See also "Lead and Zinc")

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10481—UTAH COPPER ENTERPRISE—VII, Flotation Practice. T. A. Rickard. (Min. and Sci. Press, Dec. 7, 1918; 4¾ pp., illus.) 20c.

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10482—CRUSHING RESISTANCE of Various Ores. (Bull. 142, A. I. M. E., Oct., 1918; 2¼ pp.) Discussion of paper by Luther W. Lennox, previously indexed.

10483—DEVELOPMENTS in 1918—Notes on Ore Dressing. A. W. Allen. (Eng. and Min. Journ., Jan. 11, 1919; 2 pp.) 20c.

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10485—NEW CONSTRUCTION—New Mining and Metallurgical Construction in 1918. (Eng. and Min. Journ., Jan. 11, 1919; 5 pp.) 20c.

FUELS

(See also "Petroleum and Natural Gas")

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10500—WAR—Mining Engineers in the War. F. F. Sharpless. (Eng. and Min. Journ., Jan. 4, 1919; 3¼ pp., illus.) 20c.

10501—WAR—Readjustment, Not Reconstruction. (Eng. and Min. Journ., Nov. 23, 1918; 3 pp.) 20c. Notes by J. R. Finlay read at a meeting of the New York Section of the Mining and Metallurgical Society of America.

10502—WAR TIME MINERAL ACTIVITIES in Washington. Edson S. Bastin. (Econ. Geol., Nov., 1918; 14 pp.)

Personals

Have You Contributed to the Association of the 27th Engineers?

Mark R. Lamb, mining engineer, is now in Paris.

Albert G. Wolf is in New York on professional business.

S. A. Ionides, metallurgical engineer, has returned to Denver, Colorado.

Basil Prescott has returned to Lordsburg, N. M., from field examination work at Santa Eulalia, Chihuahua, Mexico.

Harry J. Wolf, of the Malm-Wolf Co., has been appointed consulting mining engineer in the U. S. Bureau of Mines.

Frederic K. Brunton left Morenci, Ariz., recently, for Douglas, where he will be engaged at the Phelps Dodge Corporation's smeltery.

R. C. Gemmell, general manager of the Utah Copper Co., returned to Salt Lake City on Jan. 14, after a stay of a month in California.

Hugh Picard was elected president of the Institute of Mining and Metallurgy, at a meeting held on Nov. 21, 1918, to succeed **Hugh F. Marriott.**

Edward Hoopes, secretary of the San Toy Mining Co., expects to visit the Lordsburg, N. M., district early in February, where he will inspect properties in which he is interested.

O. C. Montgomery, formerly superintendent of the Oneida Mines Co.'s operations on the Cuyuna Range, is in charge of the Ida Mae mine, Cuyuna-Minneapolis Iron Co., Crosby, Minnesota.

Arthur E. Anderson, formerly assistant chief engineer for the Oliver Iron Mining Co., in the Virginia, Minn., district, is now assistant to **J. Uno Sebenius,** general mining engineer at Duluth, Minnesota.

Lieut. F. A. Kelley, recently stationed at Camp Humphries, Va., as an instructor of engineers, has been appointed superintendent of the Majorca mine of the Pickands-Mather Co., at Calumet, Minn. He succeeds **Charles H. DeVay,** who resigned.

Michael H. Loveman, formerly chief geologist of the Burma Mines, Ltd., has opened an office at 32 Broadway, New York, for the practice of mining geology. He will undertake prospecting and exploration work and the examination of mineral deposits; also geological mapping and the microscopic examination of rocks and ores.

Roswell H. Johnson, of Pittsburgh, Penn., recently registered at the office of the American Institute of Mining Engineers, New York. Others who registered there during the week were R. G. Wayland; J. A. Stewart, of Minneapolis, Minn.; Douglas B. Sterrett, Washington, D. C.; Raymond H. Summer, Wilmington, Del.; and Raymond B. Ladoo, of Cambridge, Mass.

John W. Sherwin has not resigned as manager of the West End and Halifax companies, as recently reported. The general manager's office has been removed from Tonopah, Nev., to Oakland, Calif., and the company is developing a Federal lease on Searles Lake, which facts were probably the cause of the error in this respect. **H. D. Budelman** has been appointed mine superintendent at Tonopah.

C. F. Kelley, president of the Anaconda Copper Mining Co.; **Walter Douglas,** president of the Phelps Dodge Corporation; **R. L. Agassiz,** president of the Calumet & Hecla Mining Co., and **Joseph Clendenin,** vice-president of the American Smelting and Refining Co., sailed for Europe on Jan. 25. They go abroad as a committee of the Copper Export Association, to look into the foreign situation.

Obituary

Edward M. Rabb, mining engineer, of Denver, Colo., died recently in Tonopah, Nev., of Spanish influenza.

Robert Anderson Cook, mining engineer, died recently at his home in New Brunswick, N. J., aged 58 years. He had been active in mining work for many years and was also chemist for the Lehigh Zinc Co., of Bethlehem, Penn. He was a member of the Engineers' Club of New York.

Chester J. Briggs, mining engineer, aged 34 years, died recently at an El Paso, Texas, hospital, of pneumonia. For the last three years he had been engaged in experimental and research work in ore concentration and in mill designing for the American Smelting and Refining Company.

Societies

American Institute of Mining Engineers, New York section, held its regular meeting Jan. 22, at the Machinery Club, 50 Church St., New York. The principal talk of the evening was from "Notes on a War-Time Trip to Europe," by H. C. Parmelee, editor of *Chemical and Metallurgical Engineering.* There was also a discussion conducted by the committee on institute activities.

American Institute of Electrical Engineers, Denver section, held its first regular dinner meeting of the year on Jan. 18, at the Denver Athletic Club. The speaker of the evening was Franklin P. Wood, of Trinidad, Colo., who addressed the meeting on the subject of "The Future of Public Utilities as Affected by the War." A lively discussion followed, entered into by F. W. Hild, E. A. West, and others.

Engineers' Club of Northern Minnesota recently elected the following officers for the ensuing year: A. Tancig, Chisholm, president; Ellery Anderson, Chisholm, vice-president; Kenneth Duncan, Hibbing, secretary-treasurer; W. R. Van Slyke, Eveleth, L. D. Davenport, Hibbing, and A. E. Anderson, Duluth, directors. The regular meeting was held at Hibbing, Minn., Jan. 25, and the annual banquet of the club, which will take place at the Oliver Club, Hibbing, on Feb. 22, was the principal item of new business discussed at that meeting.

Teknik Club, of Denver, Colo., held its first regular meeting and dinner of the year on Jan. 14, at the Shirley Hotel. Henry W. Dahlberg, of the Great Western Sugar Co., addressed the meeting on the subject of "The World's Sugar Supply," and was followed by Prof. I. E. Cutler, of Denver University, who explained in an illustrated lecture the effects of "Xenia." Howard C. Parmelee, formerly secretary of the club and now editor of *Chemical and Metallurgical Engineering,* was elected an honorary member. About 50 members were present.

Industrial News

General Briquetting Co., 25 Broad St., New York, is installing its new demonstration and custom briquetting plant at 57th St. and 12th Ave., New York. H. K. Schoch, chemist, recently with the National Bureau of Standards, Washington, D. C., and George R. Cowan, briquetting engineer, of Ellington Field, Texas, have resumed their positions with the company, at 25 Broad Street.

Wheeler Condenser and Engineering Co., of Carteret, N. J., announces that it has obtained from the Schutte & Koerting Co., of Philadelphia, through the Alien Property Custodian, the exclusive right to manufacture and sell steam jet air pumps under patent No. 968,926, in connection with surface condensers, jet condensers, barometric condensers, vacuum pans and evaporating apparatus. Test data and full information will be sent on request.

Trade Catalogs

Waugh Drill Steel Punching Machine. Denver Rock Drill Manufacturing Co., Denver, Colo. Bulletin 10-V, Dec., 1918; 6 x 9¼; pp. 4; illustrated.

Tractors. Woodward Garage and Truck Attachment Co., Pico and Alvarado Sts., Los Angeles, Calif.; 8½ x 11; pp. 6; illustrated. Descriptive of industrial and lumber tractors.

Ladew Leather Belting. Edw. R. Ladew Co., Inc., Glen Cove, N. Y.; pp. 108; 6 x 9; illustrated. A book devoted to Ladew leather belting, giving the history, standards, policies, and methods of the company.

Roots Rotary Blowers. P. H. and F. M. Roots Co., Connersville, Ind. Catalog No. 68; 11 x 8½; pp. 48; illustrated. Descriptive of Roots products, among which are blowers, gas exhausters, water pumps, vacuum pumps, and valves, and of the purposes for which they are used.

Steelcrete Machine Guards. Expanded Metal Engineering Co., 8 West 40th St., New York. Pp. 40; 3½ x 6½; illustrated. A catalog describing Steelcrete machine guards, mesh for reinforced concrete, special meshes, machine guard accessories and other products, and the various ways in which they can be used to advantage.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Phosphate—Process for Making Phosphoric Acid. William H. Allen, Detroit, Mich. (U. S. No. 1,285,575; Nov. 26, 1918.)

Potash—Treatment of Feldspar, Leucite, and the Like. Franz A. Rody, Johnson City, Tenn., assignor to Metallurgical Co. of America, New York, N. Y. (U. S. No. 1,285,796; Nov. 26, 1918.)

Potassium Bearing Silicates, Method of Treating. Walter Glaeser, Brooklyn, N. Y., assignor, by mesne assignments, to Potash Extraction Corporation, New York, N. Y. (U. S. No. 1,285,121-2; Nov. 19, 1918.)

Potassium from Flue Dust, Process of Extracting. Edward W. Haslup, Bronxville, N. Y., assignor to Haslup & Peacock, Inc., New York, N. Y. (U. S. No. 1,285,-152; Nov. 19, 1918.)

Reduction, Process for Treatment of Ores and Solid Salts by Electrochemical. Adrien Armand Maurice Hanriot, Paris, France. (U. S. No. 1,285,690; Nov. 26, 1918.)

Rock-Drill, Gasolene. Rolland S. Trott, Denver, Colo. (U. S. No. 1,286,152; Nov. 26, 1918.)

Sulphuric and Hydrochloric Acids, Process for Manufacture of. Harry V. Welch, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,285,856; Nov. 26, 1918.)

Sulphur in Globular Form and Process of Producing. Ray P. Perry, Upper Montclair, N. J., assignor to Barrett Company. (U. S. No. 1,285,358; Nov. 19, 1918.)

Tungsten, Etc., Powder, Method of Producing Hollow Objects of Compressed Metallic. Carl A. Pfanstiehl, Highland Park, Ill., assignor to Pfanstiehl Company, Inc., Chicago, Ill. (U. S. No. 1,286,089; Nov. 26, 1918.)

Tunnel Oven. Conrad Dressler, Marlow, England. (U. S. No. 1,285,647; Nov. 26, 1918.)

Vapor Converters, Cathode Structure for. Sidney W. Farnsworth, Pittsburgh, Penn., assignor to Westinghouse Electric and Manufacturing Co. (U. S. No. 1,285,966; Nov. 26, 1918.)

Vapor Converters, Shielding Apparatus for. Sidney W. Farnsworth, Pittsburgh, Penn., assignor to Westinghouse Electric and Manufacturing Co. (U. S. No. 1,285,-967; Nov. 26, 1918.)

Furnace, Electric. Olof Sahlin, London, England. (U. S. No. 1,286,794; Dec. 3, 1918.)

Furnace, Melting. Theodore W. Muckle, Denver, Colo., assignor to Case Manufacturing Corporation, Denver, Colo. (U. S. No. 1,286,719; Dec. 3, 1918.)

Magnetic Ore, Apparatus Involving Demagnetizing for Treating. Edward W. Davis, Minneapolis, Minn. (U. S. No. 1,286,-247; Dec. 3, 1918.)

Nitrates From Ammonia, Etc., Process for Producing. Carl Theodor Thorssell and Harold Ludvig Reinhold Lunden, Gottenborg, Sweden. (U. S. No. 1,286,838; Dec. 3, 1918.)

Nitrate of Calcium, Process of Producing. Carl Theodor Thorssell and Harold Ludvig Reinhold Lunden, Gottenborg, Sweden. (U. S. No. 1,286,839; Dec. 3, 1918.)

Ore Treatment—Process of Treating Rebellious Rare-Metal Ores. Alfred L. Pellegrin, Tucson, Ariz. (U. S. No. 1,286,400; Dec. 3, 1918.)

Potash—Method of Treating Silicates Containing Potash and Alumina. Harmon N. Morse, Baltimore, Md. (U. S. No. 1,286,-718; Dec. 3, 1918.)

Potash—Process of Extracting Soluble Potassium Salt From Feldspar. Henry Blumenberg, Jr., Los Angeles, Calif., assignor to Chemical Construction Co., Los Angeles, Calif. (U. S. No. 1,286,513; Dec. 3, 1918.)

Screen. John O'Brien, Stayner, Ont., Canada. (U. S. No. 1,286,888; Dec. 3 1918.)

Smelting—Process of Recovering Copper From Sulphide Ores and Ore Products in Electric Furnace. Gustaf Newton Kirsebom, Kjöbenhavn, Denmark. (U. S. No. 1,286,652; Dec. 3, 1918.)

Steel—Process for Eliminating Pipes and Segregated Metal From Ingots. Thomas H. Mathias, Buffalo, N. Y., assignor to Lackawanna Steel Co., Lackawanna, N. Y. (U. S. No. 1,286,379; Dec. 3, 1918.)

Editorial Correspondence

PHOENIX, ARIZ.—Jan. 23

The New Apache Railway, tapping a new timber district, with 72 miles of trackage, will also develop a new lignite coal field south of Holbrook. Plans are being made for installing a great steam plant for generating electricity at the coal beds, and for wiring to points along the Santa Fe and to the mines of central Arizona, including Globe, Miami, Jerome and Prescott. The coal is considered equal to the best at Gallup.

Establishment of a State Smelting and Sampling Plant, to operate on a 10% profit basis, was provided for in a bill introduced in the last Arizona Legislature. Though it was alleged by members that small shippers were being "robbed" by custom smelters, the mining members looked askance at the measure and secured its reference to a special joint committee, of which Senator J. C. Devine, of Pinal County, was made chairman. This committee has had three meetings, but has spent no part of the $1000 appropriated for its investigations. One of its members states that a report will be filed soon and that it will recommend "no action," with some reference to the present unusual conditions in the copper industry of the state.

Application of Desert Power and Water Co. to increase the rates for power supplied to mines was denied by the Arizona State Corporation Commission on Jan. 11, which ruled that the consumer should not be called upon to stand all the burden created by war conditions, but that utilities corporations should bear a portion of it in smaller returns and not expect to realize fully on investments until the return of normal conditions. The opinion recognizes that the company is entitled to partial relief and permits a temporary surcharge of 15⅓% until otherwise ordered by the commission, but the application for an increase in rates is denied. The company supplies power in the Oatman, Gold Roads and Chloride mining districts in Mohave County. The application was opposed by the Tom Reed and Great Eastern mines, the largest customers of the company.

TONOPAH, NEV.—Jan. 23

The Tonopah Divide Mine is attracting much comment. Levels from the main shaft have explored the main vein on the 160, 265 and 370 levels, and the shaft has been sunk to the 470-ft. point, where a station is being started and a crosscut will be driven to the vein first exposed. The "gold" vein was cut on the 265 level, 580 ft. south of the shaft. The "new" vein was exposed on the 370 level by the southeast foot-wall drift on the main "silver" vein, 250 ft. from the shaft crosscut. The silver vein was exposed on the 160 level by the crosscut driven for the purpose of exploring the gold vein, which had yielded rich gold ore near the surface, higher on the mountain. The silver vein crops boldly, but the croppings show little of value. It was cut 145 ft. from the shaft and has been developed for over 300 ft. on the three levels, showing an average width of 26 ft., all ore of excellent grade. A drift east on the gold vein, at the 265-ft. level, advanced on from two to four feet of ore assaying from $40 to $80 per ton. The main silver vein strikes southeast, the new vein northeast, and the gold vein due east. In developing the silver vein, foot-wall drifts have been extended northwest and southeast, with crosscuts and raises at 50-ft. intervals to block out the ore. At the point where the new vein was exposed on the 370 level, a drift was started southwest along its foot wall and a crosscut advanced through the vein, back of the foot wall of the silver vein. The rock between these faces was broken down to the point where an 18-ft. face was exposed, all of the ore averaging above $160 per ton and car samples from this face averaging $177 per ton. The crosscut has advanced over 30 ft. without showing the hanging wall. At 24 ft. the crosscut assays fell to $46, but the next round increased to $68. A 9-foot crosscut north into the silver vein here averaged $268 per ton. Both the silver and new veins stand nearly vertical, with slight dips, respectively, to the northeast and southeast, and are nearly at right angles. A. I. D'Arcy, consulting engineer, says the newly found vein is the older fissure and is cut through by the silver vein, which probably derives its enrichment from the great cross vein. The ground at the junction is greatly crushed and shows wide seams and masses of kaolin, filled with particles and sheets of compact, glassy horn silver, some of this ore assaying over 1000 oz. silver per ton. Shipments approximating 30 tons daily are being sent to MacNamara mill at Tonopah, where a 92% extraction is secured by cyanidation. An ore dump at the shaft contains 6000 tons of $30 ore, but this is not being shipped, as it is in part from the upper level, where the ore contains molybdite, or yellow oxide of molybdenum, which is highly destructive of cyanide. On levels below the molybdenum metal is powellite, a calcium molybdate that is not soluble in cyanide or any alkaline solution. The water level here is estimated to be not less than 700 ft. Professional reports describe the geology as overlying rhyolite flows, with deeper strata of rhyolite breccia, the ore channels of greater importance being encased in the latter. The principal owners of the Divide property are H .C. Brougher, of Tonopah, and George Wingfield, of Reno, the latter president of the Goldfield Consolidated.

BATESVILLE, ARK.—Jan. 23

Contracts for the Sale of 2000 Tons of Arkansas Manganese Ore from the Batesville field have been made with Steel Corporation subsidiaries at the following prices: Ore of 45%, 55c. per unit, or $24.75 per ton; 46%, 60c., or $27.60 per ton; 47%, 65c., or $30.55 per ton; 48%, 70c, or $33.60 per ton; 49%, 75c., or $36.75 per ton; and 50%, 80c., or $40 per ton. These prices include Chicago delivery, and freight to Chicago is $4.56 per ton. As the cost of mining at Batesville has been lowered recently, these prices probably mean a fair return to favorably situated properties. A recent carload shipment to Birmingham running less than 50% was settled for at 80c. per unit, f.o.b. Birmingham, freight to Birmingham being under $3. Contracts are now under negotiation with Batesville producers for shipment of 10,000 tons over a period of a year at about the prices given above.

DULUTH, MINN.—Jan. 25

The Second Wave of Influenza has struck the Minnesota ranges, and, though not as serious as the first one, is causing marked reductions in the working forces of the mines.

Underground Miners Returning from Service in the Army are being put to work at their old jobs as fast as they are discharged, and returned men from other divisions of the industry are being accommodated during the dull season almost without exception. These will be put back on their old jobs as soon as shipping opens.

Stripping Operators are being greatly benefited by the non-appearance of the heavy frosts usual to the Minnesota ranges at this time of year. Many operators who are annually forced to close down or curtail about Jan. 1, because of excessive powder costs, are still running at full capacity, with every prospect of continuing right through until spring. The Winston-Dear Co., Butler Bros., Guthrie Bros. and the Oliver Iron Mining Co. are included among these.

Alien Workmen of the Mesabi, Vermilion and Cuyuna Ranges who refuse to declare their intention of remaining in this country after the restoration of peace will be called upon to waive their income-tax exemption and pay to the Federal Government a 2% tax based on their gross earnings during 1918. On the January pay day at all mine offices on these ranges, each alien workman was given the privilege of becoming a declarant or a non-declarant. Figures available at this time indicate that more than 50% of such employees have waived their exemption and intend to return to their native lands at the first possible opportunity.

A Surtax of Two Per Cent. on the Value of Ore at the mouth of the mine is provided for in one of four bills of direct interest to mine owners and operators that are before the Minnesota Legislature, now in session, which is paying particular attention to the mining industry. This surtax is the legitimate successor of the tonnage tax bills of previous sessions. Another bill is a part of the Non-Partisan League program and provides for a tax of 10% on the net value of the ore as determined by chemical analysis. A Senate bill would make it unlawful for a corporation to pay a salary to a deputy sheriff to act as watchman over its property, and another Senate bill provides that any worker who pays a certain weekly sum for medical attendance shall have the privilege of choosing his physician.

VICTORIA, B. C.—Jan. 23

Ore Resources of the Greenwood District of British Columbia are to be investigated by two government mining engineers appointed by the Minister of Mines, William Sloan. They are expected to submit reports at the earliest possible moment. This step was taken by Mr. Sloan after listening to the representations of citizens of Greenwood who are making efforts to have the local smeltery of the Canada Copper Corporation reopened.

The Mine Owners' Association of British Columbia will not recognize the committee which has been authorized by the Dominion government to investigate the question of rates charged for ore treatment by the Consolidated Mining and Smelting Co., at its Trail smeltery, has been stated in effect by C. F. Caldwell, president of the association. Mr. Caldwell says: "Should the mine owners appear before this committee they would be giving their approval of this mode of investigation. We publicly protested to both the Dominion and Provincial governments against the committee form of investigation, believing it was brought about for the express purpose of defeating the resolution of the mine owners, which asked for the appointment of a Royal Commission, one member to be chosen by the mine owners, one by the smelter, and one by the government. This would have been an investigating commission which would have brought results." A meeting of the committee was scheduled for Jan. 21 at Nelson, British Columbia.

THETFORD, QUE.—Jan. 20

Operations in the Asbestos Industry in Quebec have in no wise diminished since the signing of the armistice. Whatever decrease may have occurred in the war demands has been taken by the unfilled orders which were being held over. The shipbuilding program of the various countries is looked to as a compensation for any decrease in war orders, so that the prospects for asbestos in the near future look promising. Labor has become more plentiful, though there is no disposition to lower wages as long as present prices for production are realized. Higher efficiency is being obtained through contract work wherever possible, as well as by means of various bonus systems when applicable. In mining, the chief point of interest is the comparative results obtained by the recently installed underground systems, in contrast to the original systems of quarrying used since the inception of the industry. It is generally held that whatever advantages may be gained by the underground system of mining for asbestos, such advantages being continuous operation in wet or stormy weather, better working conditions for the winter season, and mechanical separation of crude, fiber and waste rock, are more than offset by the advantages of quarrying. Among the latter are cheaper rock blasting, superior advantages for sorting of crudes from mill-rock as well as mill-rock from waste rock and earth, and cheaper handling and freedom from wood splinters in the fiber. A system of ore storage bins is now being tried, to take care of any excess production that may accrue.

Chrome Operations in Quebec have fallen off the last few months, and general interest is now evidenced in the question as to whether the Canadian industry will survive the competition of pre-war competitive fields, such as New Caledonia and Asia Minor. Several companies are equipped with up-to-date concentrating plants, backed up by deposits of considerable value,

but these would again be unable to meet the same prices which put the Canadian chrome industry out of business in 1909. Criticism has been leveled by operators against the Canadian government for using undue influence to get the operators to intensify production, only to allow them to shoulder their own losses when the reaction caused severe losses. Much resentment is also felt toward government authorities, who from time to time have cast aspersions on methods followed by the chrome miners. It thus has been frequently mentioned that the lack of success in the Canadian chrome industry is due to lack of efficient mining methods, particularly as regards sufficient development work. It is pointed out that such opinions can gain ground only with those ignorant of conditions. It is held that deposits in the Black Lake-Coleraine area always have been of the indeterminable type, occurring in lenticular formations of unknown characteristics. This entirely geological problem has not been solved by the geological authorities. It is further maintained that successful mines now operating are freaks of discovery which defy classification. For example, the premier deposit at Danville was purchased as an asbestos property, with no suspicion of chrome within miles; the successful Dominion Mines and Quarries was condemned as below commercial value in 1901; and one of the most successful properties has been opened and developed by a man of no mining experience. It is held by some that until the Quebec government can imitate the action of the Ontario government in past years, in assisting the chrome miner in solving economic mining and geological problems, it might well reserve its criticism of those who are doing their best in the task of putting the chrome industry on its feet.

MELBOURNE, AUSTRALIA—Dec. 17

Power Supply for Electrolytic Treatment of the Mount Read and Rosebery zinc sulphides presents a difficulty that has brought together the Mount Lyell and Electrolytic Zinc companies (the latter has an option over a large parcel of power from the Tasmanian Government's Great Lake hydroelectric scheme), and the present indications are that a contract covering the treatment of a certain tonnage during the next three years or so will be entered into. The intention of the Mount Lyell company is to erect its own works having an output of 75 tons electrolytic zinc per day, but that is dependent on the development of the King River hydroelectric scheme by the government, which will take several years.

The Broken Hill Mines prior to the war used enormous quantities of imported Oregon fir for mine timber, but the shortage of shipping gradually compelled them to use local timbers, and now they are becoming enthusiastic on the subject. A number of the companies have taken forest areas in South Australia and Tasmania and are erecting sawmills, or have already done so. The Zinc Corporation, which has a large area at Myponga, South Australia, is embarking also on an afforestation scheme, so that it is possible that in 30 years' time this company's principal income will be derived from the sale of timber.

The Mining News

ARIZONA

Cochise County

SHATTUCK-ARIZONA (Bisbee)—Lead mill closed Jan. 15, about 40 mill men being laid off as well as about 45 men underground.

GREAT WESTERN (Courtland)—Leasing miners have made good profits on ground that gave slight return to owners two years ago. Workings not over 300 ft. deep.

PEABODY CONSOLIDATED (Johnson)—This and Arizona United, Dragoon Mountain, and Keystone mines have suspended copper ore shipments, as present smelter settlements on 16-c. basis fail to pay costs.

BUNKER HILL (Tombstone)—About 25 lessees working in old Bonanza mines, which is only local activity.

Greenlee County

ARIZONA COPPER (Clifton)—December copper production was 3,600,000 pounds.

LESZYNSKY (Clifton)—Property, near Metcalf, under lease to John Christy, who has purchased machinery for 200-ton mill. Mill construction made necessary by closing of Shannon works, which had been handling output.

Mohave County

BRUNSWICK (Chloride)—Installing electric equipment purchased from Bullion property.

CHLORIDE QUEEN (Chloride)—Drifting on 220 level to cut silver vein developed on higher level.

ELKHART (Chloride)—Development to be resumed at once.

MINNESOTA-CONNER (Chloride)—Being unwatered, preparatory to development.

CHIMEHUEVIS (Kingman)—Copper claims located 22 miles south of Yucca by Asa LeBaron and J. K. P. Fancher.

LEXINGTON-ARIZONA (Oatman)—Sinking resumed in 126-ft. shaft. Ore cut on 126 level. H. E. Wood, stockholder and Texas oil operator, in charge.

Pinal County

RAY CONSOLIDATED (Ray)—Air locomotives operating successfully. These have displaced electric haulage in all but one main drift.

RAY SILVER-LEAD (Ray)—In last six months has produced over 5000 tons of ore, carrying more than 30% lead, with good silver content. To build road to avoid packing ore on mules over three-mile trail to Ray. Property now in litigation, on complaint of F. C. Armstrong, president of Ray-Hercules, who claims that lease on Ray Silver-Lead taken by C. E. Adams, former Ray-Hercules manager, should have been credited to Armstrong's account.

MAGMA COPPER (Superior)—December production was 1,049,783 lb. of copper.

Yavapai County

CONGRESS (Congress)—Two 40-stamp mills and roaster being demolished and sold piecemeal. Alvarado mill also being junked.

McCABE-GLADSTONE (Humboldt)—Sold to New York company represented by J. C. Rankin and Charles Batre. Sellers reserve about 20,000 tons tailings from old McCabe mill, now being shipped to Consolidated Arizona mill for recovering gold by flotation.

SILVER BELT (Humboldt)—New shaft, designed to get under old workings, has cut 12-ft. ledge of good ore at 125 feet.

CALUMET & JEROME (Jerome)—Vice-President C. M. Garrison states diamond drilling started on Calumet claim Jan. 20. Additional development work planned. Company had almost shut down, owing to labor and war conditions as well as influenza.

UNITED VERDE (Jerome)—Purchased several hundred acres of orchard land near Clarkdale smeltery, whereon vegetation is alleged to have been killed by stack fumes.

COMMERCIAL (Skull Valley)—Phelps Dodge ore shipments from Copper Basin discontinued, and mine force dropped. Similar action taken by many small copper properties of county.

CALIFORNIA

Alameda County

CHROMAN (Livermore)—Compressor and other machinery being installed to treat 50 tons daily. Chrome ore of good grade. Employ 15 men.

WIGGINS CHROME (Livermore)—Concentrator installed. Employ 20 men mining and treating 50 tons daily.

COLORADO

Boulder County

COLORADO PITCHBLENDE (Boulder)—Has taken over Blue Jay, Brownspar, Emmett, Argo, Alice, Warren, and Terry properties near Jamestown. Excavating and grading under way for addition to Golden Age mill at Springdale, where company's ores will be treated. Capacity of mill after enlargement will be 120 tons per day. J. F. Barnhill is manager. Four sets of assayers working on 20 samples of company's products. Results will be published soon.

ALASKA TUNNEL (Ward)—This tunnel, portal of which is at Brainerd camp, will be advanced to cut Utica, B. & M., and Wirth properties. Active development under way at Celestial Extension property, and payable ore opened.

IDAHO

Custer County

EMPIRE COPPER (Mackay)—Report that property has been purchased by Nipissing Mines, of Cobalt, Ont., denied by latter's New York office. Option was held but dropped.

Shoshone County

HERCULES (Burke)—Development work only; 35 to 40 men employed.

SHERMAN (Burke)—Lower crosscut to orebody, which is exposed in two levels above, cut blind lead containing considerable galena. Several hundred feet to main vein.

CHICAGO-BOSTON (Wallace)—Quarters being prepared for employees and surface equipment installed preparatory to working Chicago-Boston. Control under option to John A. Percival, of New York, president of Interstate-Callahan company. Shaft down 200 ft., showing good body of lead-silver ore on two levels. Ore exposed 300 ft. in lower tunnel.

SUNSET (Wallace)—All work suspended and pumps drawn. Shaft down 1000 ft. and vein explored on various levels, exposing much lead and zinc ore. Property owned by ex-Senator W. A. Clark, of Butte, whose plans regarding further development are unknown.

TAMARACK & CUSTER (Wallace)—Development work only; 20 to 25 men employed, majority being in Puritan crosscut to main vein.

KANSAS

Joplin District

QUEEN ESTHER (Joplin)—Will sink new shaft on property southwest of Baxter. Underground development has proved up orebodies at second level, a little over 200 ft. down. Upper level worked out.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Company and subsidiaries beginning Jan. 20 established working schedule of four days one week and five the next in alternation, equal to working time of 75% of that recently existing, when properties were running at 85 to 90% capacity. Thus operations are reduced by 35-40% of capacity.

SENECA (Calumet)—Sinking temporarily stopped while 200 ft. or more of concrete work is being done where shaft makes turn on entering formation. Foot wall not yet in sight, shaft being only half through lode.

MINNESOTA

Cuyuna Range

FERRO—(Ironton)—Sinking shaft deeper. Manganiferous property of Onahman Iron Company.

HOPKINS (Ironton)—Breitung & Co. property, manganiferous producer, shut down Jan. 12 to install larger pumps. Will renew operations in spring.

Mesabi Range

MAJORCA (Calumet)—Considerable stripping being done in preparation for spring shipping. The washing plant is being overhauled.

MISSOURI

Joplin District

ST. REGIS (Joplin)—Has good drill strikes on property at Chitwood and will sink third field shaft.

LITTLE BILL (Joplin)—Is in rich run. Now one of best producers Joplin camp has had in months. Operating at about 180 ft. W. J. Cochrane, Webb City, manager.

MONTANA

Mineral County

ST. LAWRENCE COPPER (Saltese)—Company again shipping copper ore, hauling six miles to railroad. Raise from lower tunnel up 50 ft. in good ore. Much ore in upper workings will be made accessible by raise. Company controlled by Pittsburgh people.

NEVADA

Esmeralda County

MERGER MINES (Goldfield)—Drift on 1350 level in ore; raise on this shoot up 45 ft.; shallow winze from level also in ore. Drift being driven from long crosscut connecting Merger shaft with Grizzly Bear workings of Goldfield Consolidated. Development work on same level in St. Ives claim opening large tonnage milling-grade ore. Will start development soon in western part of this claim seeking extension of Grizzly Bear oreshoots. Milling of custom ores at Goldfield Consolidated by flotation discontinued temporarily. Merger company has agreement with Spearhead company permitting development of Sunflower claim through Spearhead ground.

SPEARHEAD (Goldfield)—On 200 level drift from old Wheeler lease workings opened oreshoot one foot wide, which widened to four feet on raising. Raise from 910 level, in south end of property, now up 100 ft., exposing good ore. Crosscutting will be done from top of raise to reach contact zone. H. F. Bruce, superintendent.

Humboldt County

ROCHESTER ELDA FINA—(Rochester)—Suit filed Jan. 1 in Washoe County against Rochester Mines. Claimed defendant has extracted ore from property of plaintiff to value of $1,216,000. Property of defendant attached. Similar suit filed in Humboldt County in September, 1918, was dismissed.

SUNSET M. AND DEV. (Unionville)—Work in new tunnel progressing satisfactorily. Will cut vein 33 ft. below deepest of old workings. First 30-ton unit of new flotation plant expected in operation within three weeks. Mill will include crusher, tube mill and K. & K. flotation machines. F. W. Lockman, manager.

Lincoln County

PIOCHE DISTRICT ore shipments for week ended Jan. 22, were: Prince Consolidated, 25 cars; Virginia-Louise, 7 cars; Combined Metals, 2 cars.

Nye County

TONOPAH SHIPMENTS for the week ended Jan. 18 totaled 7450 tons, estimated gross milling value being $126,650. Shippers were: Tonopah Belmont, 2124 tons; Tonopah Mining, 1100; Tonopah Extension, 2280; West End, 1102; Jim Butler, 237; Montana, 54; Tonopah Divide, 225; MacNamara, 230; Midway, 82; and miscellaneous, 16 tons.

Washoe County

MINE OPERATORS' ASSOCIATION, of Reno, elected W. H. Blackburn, of Tonopah, president; E. A. Julian, first vice-president; L. A. Friedman, second vice-president; and Henry M. Rives, secretary.

White Pine County

NEVADA CONSOLIDATED (Ely)—Mine force reported two weeks ago to have been reduced by 1000 men. Endeavor being made to retain men having dependents. One-half of concentrator said to be closed also. Smeltery operating with slightly reduced force. Confirmation or denial could not be obtained from New York office.

NEW MEXICO

Grant County

ATWOOD (Lordsburg)—Will continue sinking new shaft on Southern group when new hoist is installed. J. Tangye, superintendent.

BONNEY (Lordsburg) — Ore survey completed, showing 45,000 tons milling ore, broken and blocked, averaging $15.57 per ton. Ore siliceous gold-silver-copper. Will install 100-ton mill and complete new power plant. J. P. Porteus general superintendent.

BOSTON-HECLA (Lordsburg)—Twenty men employed building road to shaft site. Will begin hauling machinery in few days. J. C. Taylor, superintendent.

CAP ROCK (Lordsburg)—Shut down owing to there being no manganese market.

EIGHTY-FIVE MINE (Lordsburg) — Mine and mill shut down owing to accident to one of Diesel engines.

LAST CHANCE (Lordsburg)—Milling 70 tons daily, concentrating 50 to 1. Meeting of directors of Pyramid Milling Co., which holds mine under lease and option from Fairley & Sholley, on Feb. 6. B. Prescott, superintendent.

OCTO (Lordsburg)—Force preparing to start deepening main shaft from 185 ft. to 500 ft. Will employ 50 men. E. J. Ernest superintendent.

GREAT EAGLE (Red Rock)—Continuing to develop fluorspar, but is not shipping.

CALUMET-NEW MEXICO (Silver City)—Mines at Pinos Altos and Magdalena, N. M. Company operating over three years at former, where it has seven claims and two fully equipped main working shafts. Complex zinc-lead-copper-gold-silver ores developed in both shafts. Ores have been shipped raw to smelteries, netting only $25 per ton, because of complexity of mixture, average contents being worth $100 per ton. Langston mine recently acquired near Pinos Altos property; has ores of same complexity but higher in gold. Langston has yielded over $150,000 in high-grade gold alone. Company at present has concentrating and separating mill nearing completion on Pinos Altos property, having following equipment purchased through Colorado Iron Works, Denver: 10 x 16 Blake crusher; 36 x 16 rolls; drag classifier (company's own type); two Colorado impact screens; two Deister-Overstrom slime tables; three Butchart tables (special riffle); plunger feeder; 4 x 4 Colorado ball mill; flotation equipment (own type); three elevators; conical tanks; East-Butte type thickener. Gould triplex water-supply pumps; Krogh centrifugal sand pumps, etc. All reservoirs, tanks, concentrate bins, etc., of concrete. Fairbanks-Morse oil engine used. All material first class and on ground. Milling problem one of separation rather than concentration. Capacity from 50 to 125 tons per 24 hours, depending on fineness of grinding necessary to secure best results. J. A. McCallum, superintendent.

OKLAHOMA

Joplin District

LUCKY KID (Douthat)—Has opened new ore run in new field shaft. Will start mill again soon.

JEFFERSON (Miami)—Has begun operation of new mill on lease near Picher. Mill originally erected by St. Louis Lead and Zinc Co. on lease near Quapaw, but heavy water resulted in plant being torn down and moved without ever being started. A. B. Clark, of St. Louis, Mo., is president of Jefferson company.

MIAMI WONDER (Miami)—Will sink two new shafts on lease southeast of Picher.

QUEEN CITY (Miami)—Has scrapped mill. Ground will be worked and material handled at Sullivan mill by Miami Mining Co. Otis White manager.

OKO (Picher)—Has purchased Lennan mill at Commerce and will move it to lease near Picher.

UTAH

Juab County

CENTENNIAL-EUREKA (Eureka)—Third shift added. Ore opened on 1900 being followed toward water level. Winze down 60 ft. from 1900.

TINTIC CENTRAL (Eureka)—Ogden-Tintic Mining Co. formed to take over property under lease. Capitalization, $50,000. O. M. Runyon, president.

DRAGON CONSOLIDATED (Silver City)—Shipping two cars iron ore daily. Demand lessened. North end worked by Tintic Milling and supplying greater part of ore treated in Tintic Milling plant.

KNIGHT INVESTMENT (Silver City)—Large new compressor added to plant near Iron Blossom, which furnishes air to number of properties. Capacity 4200 cu.ft. per minute.

Piute County

BRADBURN (Marysvale)—Car of potash ore shipped to Florence mill from this property being developed by Swift & Co. Another car shipped to company's plant at Harvey, La. Stated that, until spring, shipments will be made to local plant first, and then East. Later, direct shipments to East will also be made.

Salt Lake County

ALTA COMPANIES shipping at present are South Hecla, Michigan-Utah, Columbus-Rexall, Sells and Alta Consolidated, although output being sent down Little Cottonwood canyon has decreased owing to bad roads. Lack of snow hampering operation of sleds, which are nevertheless in use.

CARDIFF (Salt Lake City)—Property in Big Cottonwood shipping 40 tons of silver-lead ore daily. Oreshoot recently opened to south on tunnel level followed 75 ft. Ore silver-lead of good grade.

Summit County

SILVER KING COALITION (Park City)—Lafayette Hanchett appointed consulting engineer. W. W. Armstrong, of National Copper Bank, Salt Lake City, president of company.

SILVER KING CONSOLIDATED (Park City)—Trial run of new 150-ton mill to treat low-grade ores, chiefly from recently acquired California-Comstock ground, reported satisfactory. Ore treated carried silver, lead and iron. Zinc reserved for later treatment. Spiro tunnel being driven to connect older ground with California-Comstock and develop ground in between, was in 9001 ft. on Jan. 1.

CANADA

British Columbia

GRANBY CONSOLIDATED M. AND S. (Grand Forks)—Three furnaces in operation. Granby mines, at Phoenix, expected to supply sufficient tonnage.

EUREKA (Granite)—Inland Mining Co., of Walla Walla, Wash., operating this copper property in Nelson division for about four months. Has spent $15,000 on development. Producing 25 tons daily and shipping to Trail smeltery. Further development planned, including construction of tramway to Canadian Pacific Ry. W. M. Meyers, mine superintendent.

MARY REYNOLDS (Merritt)—Property has 100 ft. shaft and 45 level drift. Stoping in progress in latter. Entire vein good milling ore, with high-grade pockets. Deeper development to start soon. Ore is silver-lead. Mine in Stump Lake district 35 miles east of Merritt.

CASSIAR CROWN COPPER (Telkwa)—To drive 90-ft. tunnel to tap vein at 75-ft. depth and then drift on ore. Vein shows strongly on surface. Property on Grouse Mountain, in Omineca Division.

CONSOLIDATED M. AND S. (Trail)—Ore receipts for first week in January totaled 7736 gross tons.

Manitoba

MANDY (Schist Lake)—Diamond drilling resumed from 200 level.

Ontario

DECEMBER SHIPMENTS of silver ore over Temiskaming & Northern Ontario Ry. were: Buffalo, 402 tons of 2000 lb.; Coniagas, 177; Dominion Reduction, 72; Hudson Bay, 32; Kerr Lake, 29; La Rose, 33; McKinley-Darragh, 74; Nipissing, 78; O'Brien, 76; Trethewey, 43; Crews-McFarlane, 30; Pittsburg Lorrain, 45; and Casey-Cobalt, 30; total, 1121 tons. Above was shipped to following companies: Deloro S. and R., 141; Coniagas Reduction, 63; Campbell & Deyell (Cobalt), 106; and American S. and R., 812 tons. Alexo shipped 507.5 tons nickel ore.

ADANAC (Cobalt) — Has encountered high-grade ore in vein cut short time ago.

OPHIR (Cobalt)—Has optioned 51% interest to Nipissing for $150,000. Latter will spend about $10,000 in exploring along Keewatin diabase contact.

PETERSON LAKE (Cobalt)—Will issue $100,000 preference stock, carrying cumulative dividend of 15c. a share per year. Will use money to increase mill capacity and to carry on development.

BURNSIDE (Kirkland Lake)—Start of milling operations indefinitely postponed, owing to non-arrival of machinery parts.

TOUGH OAKES (Kirkland Lake)—At annual meeting in Toronto on Jan. 21, announced that, owing to termination of litigation, control of property had been handed over to following directors, elected January, 1916: Harry Oakes, R. J. Robins, John B. Holden, J. Y. Murdoch and A. Burt. Number of directors reduced from seven to five, head office changed from Haileybury to Toronto, and sale of unissued shares at discount of not less than 55% of par value authorized. Investigation and report by competent engineer will be made before any program will be adopted.

PORCUPINE CROWN (Porcupine)—At annual meeting on Jan. 22, president Sir John Carson announced board hoped to resume active operations soon.

MEXICO

MINES CO. OF AMERICA preparing to resume operations at Mexican properties with improvement of conditions in Mexico. Hayden, Stone & Co. announces it has completed plan of reorganization by which the necessary working capital will be supplied. Assets of present company will be sold to new corporation to be known as Dolores Esperanza Corporation, with the same number of shares. Holders will be permitted to purchase stock in the new company or surrender of old stock and payment of $ a share.

The Market Report

SILVER AND STERLING EXCHANGE

Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
23	4.7580	101⅛	48 7/16	27	4.7580	101⅛	48 7/16
24	4.7580	101⅛	48 7/16	28	4.7580	101⅛	48 7/16
25	4.7580	101⅛	48 7/16	29	4.7580	101⅛	48 7/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Jan.	Copper Electrolytic	Tin Spot.†	Lead N. Y.	Lead St. L.	Zinc St. L.
23	*	67	5¼ @5¼ 5¼	5.15 @5.20 5.10	6.60 @6.70 6.55
24	*	67	@5¼ 5¼	@5.20 5.10	@6.60 6.55
25	*	67⅛	@5¼ 5¼	@5.20 5.00	@6.60 6.55
27	*	67⅛	@5¼ 5.10	@5.20 4.92½	@6.60 6.50
28	*	67¼	@5.15 5	@5.17½ 4.92½	@6.55 6.55
29	*	67½	@5¼	@5.07½	@6.60

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

* Undetermined.

† For American tin of 99% grade.

LONDON

Jan.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
23	91	82	105	248	244	35	30	56
24	90	83	105	248	245½	35	30	56
25	...	...	...	...	...	...	...	...
27	89	83	105	248	244½	35	30	56
28	89	83	105	246	242½	35	30	56
29	88	83	105	244½	(a)	34	30	56

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

(a) No quotation.

Metal Markets

NEW YORK—Jan. 29, 1919

The markets show gradually more signs of developing upon a regular basis, especially those that are freest from meddling, or rather, we should say, those in which nature has been allowed to take its course.

There is a tendency to exaggerate the amount of the stocks of metals held abroad; but, nevertheless, there is no doubt about their being large, and good authorities on the other side express the belief that they will be found to be ample for all requirements for some months to come.

The market for sulphuric acid of 60° B. in the Middle West has dropped to $9.50 per ton, f.o.b. works.

The reduction in freight rate to Europe to 1c. per lb. was an important event of this week.

Copper—No sales of copper were made this week by any of the large producers. We have reports of sales by several of the small producers aggregating 2,850,000 lb., which were all made on the 28th at 18¾ @ 19c. We have heard indirectly of some other sales made by small producers from whom we do not receive reports, amounting perhaps to 1,000,000 lb. more. The best estimates are that the total sales from Jan. 1 to Jan. 25 aggregated about 20,000,000 lb., and since Jan. 25 we may add about 4,000,000 lb. This illustrates the situation completely, viz. small sales in the aggregate, sporadically made at variable and uncertain prices. There has not been, and is not yet, any market in the broad sense, but at this writing there are signs that things are coming to a head and that there will soon be conditions approaching the natural.

Copper Sheets—The base price of copper sheets is 29c. per lb. Copper wire is quoted at 22½@23c. per lb. f.o.b. mill, carload lots. Unchanged.

Tin—There is no change in the elements of the situation in this metal, except that the Government seems to be becoming more strenuous in its attempts to force metal upon consumers who do not want it. Some lots of Banka and Straits tin, amounting to 275 tons, were advertised for auction today. One lot of 25 tons was sold at 71.1c., this being apparently to establish a record for some purpose. The other parcels were withdrawn, apparently so as to avoid any record being established. We quote the market from day to day on the basis of American tin.

The American Iron and Steel Institute, under date of Jan. 23, issued a circular letter saying that the U. S. Steel Products Co. has now been authorized to fill all orders at the Government price, regardless of the quantity.

Lead—A larger amount of business was done this week than in the previous week, both in specific sales and in contracts to be settled on average prices. There is a good deal of irregularity in the terms. Thus, on Jan. 27 lead was offered in tonnage at 5c., St. Louis, as we learned from several parties to whom it was offered, while on the same day a round lot was actually sold at 5.20c., St. Louis. This discrepancy we are unable to explain. Differences in price in New York are explained by whether lead is quoted as actually here or for prompt shipment hither. An interesting feature of the week was the appearance of offers of considerable tonnage originating from manufacturers who desired to dispose of surplus.

The home trade in pig lead and manufactured lead in France has been freed from control, but the license system will remain in force for imports and exports. The production of lead in Germany is no longer controlled officially, and the maximum prices have been abolished. Producers are free to sell as they please.

Zinc—With the further decline in this market the volume of business increased from day to day, and on Jan. 28 considerable buying developed around 6.50@6.55c. Practically all of this business came from galvanizers, who seem to have become interested in spelter at this level.

Zinc Sheets—Unchanged at $13 per 100 lb.

Other Metals

Aluminum—Unchanged.

Antimony—The market was quiet. We quote spot at 7¼@7⅜c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40@1.45 per lb. in lots of 100 to 500 lb.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—California virgin is quoted at $100. San Francisco reports, by telegraph, $102.50.

Silver and Platinum

Silver—Market remains unchanged and steady. For the week ended Jan. 25, shipments to London were 1,090,000 oz. December shipments from San Francisco were 34,268,000 ounces.

Mexican dollars at New York: Jan. 23, 77½; Jan. 24, 77½; Jan. 25, 77½; Jan. 27, 77½; Jan. 28, 77½; Jan. 29, 77½.

Platinum—Unchanged.

Palladium—Unchanged.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 25—Blende, per ton, high $52.80; basis 60% zinc, premium, $50; Class B, $42.50; Prime Western, $40; sludge, $37.50; calamine, basis 40% zinc, $35@30. Average selling prices: Blende, $43.08; calamine, $36.46; all zinc ores, $42.95.

Lead, high, $64.70; basis 80% lead, $60@58; average selling price, all grades of lead, $59.82 per ton.

Shipments the week: Blende, 11,588; calamine, 237; lead, 1101 tons. Value, all ores the week, $573,790. Shipments the month: Blende, 43,708; calamine, 1031; lead 4991 tons. Value, all ores the month, $2,239,370.

Buyers of Prime Western grades offered but $40 basis this week, and they and sellers stood firm, the latter refusing to accept. Though the shipment is a large one, sales dropped approximately 60 per cent.

Platteville, Wis., Jan. 25.—Blende, basis 60% zinc, $70 per ton base for premium grade; $45 down to $42 base for high-lead blende. Lead ore, basis 80% lead, $56 to $60 per ton. Shipments reported for the week were 1946 tons blende, 62 tons galena, and no sulphur ore. For the year to date the totals are 5862 tons blende, 335 tons galena, and no sulphur ore. During the week 3241 tons blende was shipped to separating plants.

Other Ores

Molybdenum—Buyers and sellers are far apart, but some small business was reported done at 85@90c.

Tungsten Ore—The talk in this market is very bearish. For the moment there is no market, for nobody seems to have the nerve to make one. If anyone did, the price might be $12 or lower. Nobody can tell.

Pyrites—Spanish pyrites is quoted at 17c. on the basis of 10s. ocean freight.

Iron Trade Review

NEW YORK—Jan. 29

Export inquiry is awakened by the sharp cuts given to ocean freight rates on both sides of the Atlantic. The disparity of British and American charges, according to "The Iron Age," has not been materially reduced, but the change is sufficient to cause concern abroad, particularly over the possibility of United States steel and iron being imported to the exclusion of the home product.

Some thousand-ton lots of finished steel for England are now in storage here awaiting favorable vessel rates, and stocks there made at high costs are not yet liquidated.

At present the chief competitor of the United States for the world's business, England's iron and steel industry, burdened with high fixed prices thrown upon it when the government discontinued its subsidy of increased labor and freight costs, is now threatened with strikes. Meanwhile in a few months 2,000,000 tons' annual capacity of blast furnaces will be in operation in Lorraine.

The pig-iron production of the United Kingdom for 1918 was about 250,000 tons below the 9,420,254 tons of 1917, and the steel ingot production of 1918 about 200,000 tons less than the 9,804,079 tons produced in 1917. In 1913 the British pig-iron output was 10,260,315 tons. These figures

show how much a handicap was the war shortage of labor.

The withdrawal by the American Iron and Steel Institute of its recommendation that the proposed uniform sales contract be adopted by the trade is understood to be due to the encountering of unexpected difficulties. The prospect for general agreement on a formal contract is not now favorable. Some companies may, however, individually adopt the contract proposed by the Institute's committee on contract obligations.

Competition with steel bars has brought bar iron in the West to a parity at 2.70c., Pittsburgh, but bar-iron makers in the East adhere to the 3.50c. price, contending that their costs are too much to permit of a reduction.

A further reduction of $2 per ton in cast-iron pipe has been made by Eastern shops, so that the total drop is $5, as in the West.

PITTSBURGH—Jan. 28

The independent steel companies are operating at an average of 60 to 65%, on the basis of tonnage capacity and actual output, but few departments are entirely closed, the work being distributed. The Steel Corporation as a whole is reported to be operating at a much higher rate, about 90%, and the explanation offered for this divergence is that the Steel Corporation is putting large quantities of steel into warehouses, its warehouse capacity being large. It is said that it is more economical to operate at 90% than at 60%, and it may be inferred that, later on, some Steel Corporation plants will be closed entirely if demand from consumers does not increase.

New business being received from week to week, in the form of fresh orders and specifications against old contracts, represents much less tonnage than is being produced, and probably not over 25% of the existing capacity. The old orders on which the mills are running will not last long, and, though a revival in demand is expected in early spring, production at that time may not be as heavy as at present.

If the scrap market is any evidence of the amount by which the excess in steel prices must be eliminated, heavy declines must eventually come. The Government price on heavy melting steel was $29, and dealers were allowed to charge 3½% commission, making the cost of scrap $30. This week, dealers are willing to sell at $18, but as a rule the highest bid of consumers is $16. Taking the mean, $17, there is represented a decline of $13 per gross ton, or 43%. Last month's declines in finished-steel products, from Government levels, averaged barely $4 per gross ton.

A fair tonnage of plates and structural shapes is being rolled for the Emergency Fleet Corporation, but there are complaints from ship-yards of over-shipments. The maximum requirements of the Fleet Corporation did not represent more than 5% of the total capacity in finished rolled steel. About 75,000 of the 100,000 freight cars ordered last spring by the Railroad Administration are still to be made, and the car shops have been speeding up on this work. The automobile factories are taking steel freely. Some manufacturing consumers, like nut and bolt producers and shafting makers, are reported to be fairly busy. Jobbers are buying sparingly, and only for known requirements. There is practically a complete absence of demand for steel for general construction purposes.

Pig Iron—There is practically no demand for pig iron, and the market is in a sense nominal, but no indication appears that definite inquiry would bring out cut prices. Shipments against contracts are somewhat curtailed, but are still heavy. We quote: Bessemer, $32.20; basic, $30; No. 2 foundry, $31; malleable, $31.50; forge, $30, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel—Regular prices for soft unfinished steel are firmly held: Billets, $43.50; small billets, $47; sheet bars, $47; slabs, $46; rods, $57. There is scarcely any demand. Shell steel, discard steel, and like forms are being offered at low rates.

Ferromanganese—Producers still name $225, delivered, as their asking price on 70%, but if any buyers were in the market they would not think of paying such a price. Resale material could probably be had at $200, and it is thought imported could be had at about $150. Spiegeleisen is nominal at $65, furnace, asked for 16 per cent.

Coke—The poorer grades of Connellsville coke, formerly shipped on contract to furnaces at the full Government price of $6, can now be disposed of as heating coke, bringing, say, $4.25@$4.75. Furnace coke of fair grade is quotable at $5.50 @ $5.75. Some operators still quote the Government limit of $6, but cannot sell at the price. Furnaces that have contracts calling for "last Government price" when Government control ends, as it will on Feb. 1, expect operators to make a concession, otherwise, some are likely to blow out. Foundry coke of best grades is still held at the Government limit of $7, but some fair brands are available at $6.50.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	101.125	34.192	43.584	48.969
Dec.	75.765	85.960	101.125	36.410	43.052	48.492
Year	65.661	81.417	96.772	31.315	40.851	47.516

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500	(a)	110.000	118.447	125.000	133.167
Year	27.180	24.628	124.892	115.530	138.401	130.507

(a) No Market.

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	(a)	247.467	335.543
November	74.740	(a)	274.943	323.550
December	87.120	(a)	298.556	267.736
Av. year	61.802	88.750	237.563	330.138

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.00
February	8.636	6.973	8.595	6.899	30.500	29.00
March	9.199	7.201	9.120	7.091	30.500	29.00
April	9.288	6.772	9.158	6.701	30.500	29.00
May	10.207	6.818	10.202	6.704	30.500	29.00
June	11.171	7.611	11.123	7.511	30.500	29.00
July	10.710	8.033	10.644	7.750	30.500	29.00
August	10.594	8.050	10.518	7.750	30.500	29.00
September	8.680	8.050	8.611	7.750	30.500	29.00
October	6.710	8.050	6.650	7.750	30.500	29.00
November	6.249	8.050	6.187	7.750	30.500	31.20
December	6.375	6.564	6.312	6.324	30.500	40.00
Year	8.787	7.413	8.721	7.222	30.500	30.10

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685	8.163	7.510	7.813	54.000	56.050
Year	8.901	8.159	8.813	7.890	52.413	54.180

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December	37.25	36.60	33.95	34.40	33.95	35.40
Year	$43.57	36.67	$39.62	33.70	$40.83	34.45

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Jan. 28
Alaska Gold M.	3⅛
Alaska Juneau	1⅛
Am.Sm.&Ref.,com.	71
Am.Sm. & Ref., pf.	106
Am.Sm.Sec., pf., A	91
Am. Zinc	11½
Am. Zinc, pf	39
Anaconda	59
Batopilas Min	1⅛
Bethlehem Steel	61
Butte & Superior	18
Butte Cop. & Zinc	6
Cerro de Pasco	31⅛
Chile Cop	17⅛
Chino	33⅛
Colo. Fuel & Iron	36⅛
Crucible Steel	54⅛
Crucible Steel, pf	90
Dome Mines	12
Federal M. & S.	9
Federal M. & S., pf	34½
Greater Nor., ore ctf	37⅛
Greene Cananea	44⅛
Gulf States Steel	54
Homestake	95⅛
Inspiration Con	44⅛
International Nickel	26⅛
Kennecott	32⅛
Lackawanna Steel	67
Mexican Petrol	169⅛
Miami Copper	23⅛
Nat'l Lead, com	66⅛
National Lead, pf	108⅛
Nev. Consol	16⅛
Ontario Min	6⅛
Ray Con	20⅛
Republic I.&S.,com.	77⅛
Republic I.&S., pf.	101⅛
Sloss-Sheffield	60
Tennessee C. & C.	‡13
U. S. Steel, com	92⅛
U. S. Steel, pf	115
Utah Copper	70
Va. Iron C. & C.	‡57

BOSTON CURB*	Jan. 28
Alaska Mines Corp.	‡.12
Boston Ely	.95
Boston & Mont.	.49
Butte & Lon'n Dev.	.12
Calaveras	1⅛
Chief Con	3⅛
Contact	‡.05
Corbin	‡.25
Cortez	.13
Crown Reserve	.42
Crystal Cop	.19
Eagle & Blue Bell	2⅛
First Nat. Cop	‡1⅛
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.45
Iron Cap	.15
Majestic	.20
Mexican Metals	.25
Mines of America	‡.75
Mojave Tungsten	.04
Nat. Zinc & Lead	.09
Nevada-Douglas	.22
New Baltic	1
New Cornelia	‡16
Oneco	.20
Pacific Mines	‡.35
Rex Cons	‡.05
Yukon Gold	.70

SAN FRAN.*	Jan. 28
Alta	.02
Andes	.03
Best & Belcher	.01
Caledonia	.02
Challenge Con	.03
Confidence	.03
Con. Virginia	.05
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt	.03
Mexican	.10
Occidental	.40
Ophir	.09
Overman	.01
Savage	.03
Sierra Nevada	.05
Union Con	.10
Utah Con	‡.01
Belmont	2.60
Jim Butler	.35
MacNamara	.80
Midway	.33
Mont.-Tonopah	.14
North Star	.06
Rescue Eula	.07
West End Con	1.25
Atlanta	.04
Booth	.13
Comb. Frac	‡.02
Florence	.13
Jumbo Extension	.13
Kewanas	.05
Nevada Hills	.03
Nevada Packard	.05
Round Mountain	.32
Silver Pick	.04
White Caps	.13

COLO. SPRINGS*	Jan. 28
Cresson Con	4.93⅛
Doctor Jack Pot	.04⅛
Elkton Con	.04⅛
El Paso	‡.14
Gold Sovereign	‡.02
Golden Cycle	1.77½
Granite	.18
Isabella	.05
Mary McKinney	.07
Portland	1.00
United Gold M.	.15
Vindicator	.42

BOSTON EXCH.†	Jan. 28
Adventure	‡.60
Ahmeek	‡7⅛
Algomah	‡.30
Allouez	43
Ariz. Com	11⅛
Arnold	‡.20
Bingham Mines	19⅛
Bonanza	‡.10
Butte-Balaklava	‡.21
Calumet & Ariz	59⅛
Calumet & Hecla	426
Centennial	‡12⅛
Copper Range	42
Daly West	‡2⅛
Davis-Daly	5⅛
East Butte	9⅛
Franklin	‡3⅛
Granby	‡79
Hancock	‡5⅛
Hedley	‡12
Helvetia	‡.20
Indiana	‡.80
Isle Royale	‡24⅛
Keweenaw	‡1
Lake	3⅛
La Salle	‡2⅛
Mason Valley	‡2⅛
Mass	‡⅛
Mayflower	2⅞
Michigan	‡3
Mohawk	52
New Arcadian	1⅛
New Idria	‡10
North Butte	‡10⅛
North Lake	‡.55
Ojibway	‡1⅛
Old Dominion	‡34
Osceola	‡52
Quincy	58
St. Mary's M. L.	‡42
Santa Fe	‡.25
Seneca	13⅛
Shannon	‡2⅛
Shattuck-Ariz	‡14⅛
So. Lake	‡1
So. Utah	‡.10
Superior	5
Superior & Bost	‡2
Trinity	2⅛
Tuolumne	.82
U. S. Smelting	45
U. S. Smelting, pf	45
Utah Apex	2⅛
Utah Con	8
Utah Metal	1⅛
Victoria	‡2
Winona	.90
Wolverine	18
Wyandot	‡.50

N. Y. CURB†	Jan. 28
Big Ledge	.75
Butte & N. Y.	1⅛
Butte Detroit	‡.01⅛
Caledonia	.30
Calumet & Jerome	⅞
Can. Cop. Corpn	2
Carlisle	‡2
Cashboy	‡.07
Con. Ariz. Sm.	1⅛
Con. Coppermines	5⅛
Goldfield Con	.21
Goldfield Merger	.06
Greenmonster	1⅞
Hecla Min	4⅛
Howe Sound	‡3⅛
Jerome Verde	‡.50
Louisiana	⅞
Magma	26
Marsh	.04
McKinley-Dar-Sa	‡.47
Milford	‡.75
Mother Lode	.32
Mixon Nevada	.41
Ohio Cop	⅞
Rawley	‡2⅛
Ray Hercules	2
Richmond	‡.56
Rochester Mines	.26
St. Joseph Lead	‡12
Standard S. L.	⅛
Stewart	‡.16
Success	11⅛
Tonopah	‡3⅛
Tonopah Ex	2⅛
Tribullion	⅞
Troy Arizona	‡.10
United Eastern	4⅞
United Verde Ext	‡35⅛
United Zinc	⅞
Utica Mines	‡.08

TORONTO*	Jan. 28
Adanac	.18
Bailey	.04
Beaver Con	.41
Chambers Ferland	.09
Coniagas	2.00
Hargraves	.03
Kerr Lake	‡5.37½
La Rose	.35
Lake Shore	.90
Min. Corp. of Can.	1.50
Nipissing	‡8.75
Peterson Lake	.08
Temiskaming	.31
Wettlaufer-Lor	.03
Davidson	‡.60
Dome Exten	.22
Dome Lake	.20
Hollinger	6.00
McIntyre	1.62½
Newray	.12⅛
Porcu. Crown	.30
Teck-Hughes	.25
Vipond	.20
West Dome	.13

* Bid prices. † Closing prices. ‡ Last quotations.